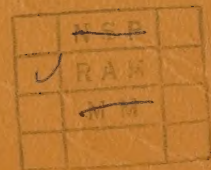




ANNUAL REPORT

1962-1963



DEPARTMENT OF AGRICULTURE
NEW SOUTH WALES

1962-63

PARLIAMENT OF NEW SOUTH WALES

REPORT
OF THE
DEPARTMENT OF AGRICULTURE
FOR THE
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AS AT 30th JUNE, 1963

DEPARTMENT OF AGRICULTURE*

Minister for Agriculture and Conservation	Hon. A. G. E. ENTICKNAP, M.L.A.
Director-General	Dr. G. EDGAR.
Director of Agriculture	Dr. H. J. HYNES.
Secretary	Mr. J. L. HAGER.
Accountant	H. J. CHARDON.
Administrative Assistant and Personnel Officer	S. W. WISE.
Pastures Protection Officer	E. J. POWER.
Legal Officer	S. T. BEAL.
Architect	H. A. BROWNE.
Chief Biometrician	F. C. MCCLEERY.
Chief Research Liaison Officer	Dr. S. L. MACINDOE.
Division of Plant Industry—	
Chief	W. H. G. POGGENDORFF.
Deputy Chief	A. C. ORMAN.
Principal Agronomist (Pastures)	C. K. VEARS.
Principal Agronomist (Research)	N. S. SHIRLOW.
Principal Agronomist (Extension)	G. NICHOLSON.
Division of Horticulture—	
Chief	H. W. EASTWOOD.
Deputy Chief	J. A. BALLANTYNE.
Principal Fruit Officer (Extension)	R. G. S. KEBBY.
Principal Fruit Officer (Research)	B. O. FRENCH.
Senior Inspector (Export and Import Branch)	R. W. ROBERTSON.
Division of Animal Industry—	
Chief	R. M. WATTS.
Deputy Chief	R. A. HALL.
Director of Veterinary Research	J. C. KEAST.
Principal Veterinary Research Officer	E. J. H. MCBARRON
Chairman, Board of Tick Control	J. N. HENRY.
Principal Veterinary Officer	N. K. GOLDING.
Principal Veterinary Officer (Meat Inspection)	R. C. CRAMP.
Principal Livestock Officer (Sheep and Wool)	C. J. HAWKINS.
Principal Livestock Officer (Beef Cattle, Horses and Goats)	W. J. B. MURPHY.
Principal Livestock Officer (Pigs)	G. M. D. CARSE.
Principal Livestock Officer (Poultry)	V. H. M. BRANN.
Principal Livestock Officer (Apiculture)	A. A. CLEMON.
Division of Dairying—	
Chief	A. C. SMALL.
Deputy Chief	J. D. L. MCGIBBON.
Principal Dairy Officer	F. A. VERNON.
Principal Dairy Officer (Herd Improvement)	C. E. CHAPMAN.
Principal Dairy Officer (Hawkesbury Agricultural College) ..	E. G. McLAREN.
Division of Science Services—	
Chief	Dr. C. J. P. MAGEE.
Chief Biologist	W. S. SUTTON.
Chief Entomologist	S. L. ALLMAN.
Chief Chemist	T. H. JOHNS.
Director of the Royal Botanic Gardens and National Herbarium and Chief Botanist	R. H. ANDERSON.
Division of Information Services—	
Chief	H. PARRY BROWN.
Editor of Publications	W. R. TURNER
Organiser, Agricultural Bureau	J. J. SLATER.
Senior Extension Officer (Women's Service)	Miss N. M. FOSKETT.
Research Liaison Officer (Scientific Publications)	J. N. POTTER.

* For details of staff of the various Divisions, Branches, etc., see New South Wales Department of Agriculture brochure "Directory of Officers".

For staff number totals see tabulation in this Report, page 23.

As at 30th June, 1963

Department of Agriculture—*continued*

Division of Marketing and Agricultural Economics—

Chief.....	C. J. KING.
Principal Economics Research Officer	P. C. DRUCE.

Hawkesbury Agricultural College—

Principal	B. DOMAN.
Deputy Principal	B. F. ATKINS.
Farm Supervisor	T. ADAMS.

Wagga Agricultural College and Experiment Station—

Principal	Dr. F. C. BUTLER.
Deputy Principal	J. R. SUTHERLAND.
Farm Supervisor	J. G. BALLANTYNE.

Wagga Agricultural Research Institute—

Director	Dr. A. T. PUGSLEY.
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Regional Extension Services—

Chief.....	J. L. GREEN.
Regional Supervisors of Agriculture—	
Southern Region	R. C. MADSEN.
North Coast Region	S. R. BALLARD.
Western Region	B. D. AMENT.
South Coast and Tablelands	R. W. SHELLEY.
South-Western Region	G. A. CRAWFORD.
Northern Region	G. R. GODDEN.
Mid-Coast and Hunter Region	H. A. GRANTHAM.
Mid-Western Region	F. J. NICHOLSON.
North-Western Region	J. A. O'REILLY.

Experiment Farms and Research Stations—

Chief, Experiment Farms and Stations Branch	A. PEARSON.
Bathurst Experiment Farm .. Manager	C. H. MORT.
Condobolin Experiment Farm .. Manager	J. C. ENGLAND.
Cowra Experiment Farm Manager	J. M. ARTHUR.
Dareton Horticultural Research Station	O.I.C. VACANT.
Glenfield Veterinary Research Station	Director
Grafton Experiment Farm .. Manager	J. C. KEAST.
Griffith Viticultural Research Station	C. E. COLLINS.
Leeton Agricultural Research Station	O.I.C. A. F. MURRAY.
Narrabri Experiment Farm .. Manager	C. R. HOOD.
Narara Horticultural Research Station	Manager
Agricultural Research Station, Glen Innes	K. F. FLEMONS.
Poultry Research Station, Seven Hills	Manager
Tamworth Agricultural Research Station	L. F. MANDELSON.
Agricultural Research Station, Glen Innes	Manager
Poultry Research Station, Seven Hills	E. TINDALE.
Tamworth Agricultural Research Station	Manager
Tamworth Agricultural Research Station	J. A. LOVERIDGE.
Temora Experiment Farm .. Manager	Director of Research
Trangie Agricultural Research Station	Dr. W. V. SINGLE.
Wollongbar Agricultural Research Station	R. THOMSON.
Yanco Agricultural Research Station	Manager
Alstonville Tropical Fruit Research Station	J. H. BALLARD.
Dairy Industry Research (North Coast)	Manager
	F. A. YORK.
	F. D. MACKENZIE.
	O.I.C.
	D. S. LEIGH.
	Supervisor
	W. J. C. HUDSON.

NEW SOUTH WALES

DEPARTMENT OF AGRICULTURE

Report of the Director-General to the Minister for the Year ended 30th June, 1963

Department of Agriculture,
Sydney, 4th October, 1963.

Dear Sir,

Herewith a Report of the Department of Agriculture for the year ended 30th June, 1963.

CENTRAL ADMINISTRATION NOTES

The Seasons

The weather showed violent fluctuations and created problems. Rainfall was above average and in coastal districts, in particular the North Coast, there were some devastating floods.

Early in the winter of 1962 the weather was comparatively dry. This was followed by useful rains in July and August, with snowfalls on the tablelands and severe frosts inland. Good rain in August brought relief to areas that needed it, but in coastal areas the falls were excessive. One of the coldest periods on record, late in August, brought the snow to the tablelands and the widespread heavy inland frosts.

Under drier September and early October conditions pastures deteriorated, and the pasture hay harvest was reduced. Cereal crops responded to the late October rains and made a splendid recovery.

November was hot, accompanied by drying winds. It was ideal for harvesting, but unfavourable for pastures. Very dry conditions now prevailed in many coastal districts.

December-January rainfall was well above average. It disrupted the harvesting of cereal crops, but in any case the wheat harvest was a record for this State. Floodings occurred on coastal rivers.

At this early stage of 1963 the northern tablelands in particular, and northern inland districts were favoured by good seasonal conditions, but the southern inland districts were dry. This helped at least the subterranean clover seed harvest.

From April onwards the rainfall in many districts has been substantially above average. Whilst the pastoral outlook is favourable at the close of the twelve months under report, the very wet conditions have seriously interfered with sowing of winter cereal crops and harvesting of summer crops.

Wheat growers had difficulty in completing sowing, because of the waterlogged condition of seed-beds and prolific weed growth. Harvesting of the summer crops, principally rice, cotton, grain sorghum and maize was delayed. This reduced production and quality. Vegetable production programmes in coastal areas have been gravely affected. Dairy production has similarly taken heavy blows.

The Floods

High river levels from western and northern inland river catchments were recorded, but damage was not serious. On the other hand, the North Coast, Central Coast and, to a lesser extent, the South Coast districts suffered a devastating series of floods.

On coastal river flats damage to structures and land was extensive, and crop and pasture production for the year was in many cases almost completely destroyed. Recovery will be slow, dependent on favourable weather and availability of finance for reconstruction.

On the North Coast, extending from the Tweed to the Manning River, there were floods in July, 1962, January, March, April, and May, 1963. The most serious flooding

occurred in July, 1962, and near to it in severity were the floodings in April and May, 1963. Damage was widespread on the Clarence, Richmond and Manning River basins.

On the Central Coast, a near-record flood occurred in the Williams River in March, 1963, with a further flooding in May. The Hunter Valley, frequently a flood problem area, escaped serious flooding, except for the lower river. Flooding of the Hawkesbury River and tributaries occurred in May. South Coast rivers also flooded in May.

Because of the flood warning system, stock losses were not heavy. Extensive hand-feeding and transfer of stock to agistment on higher country have been necessary.

Commodity Notes

Despite the range of seasonal conditions, production in most cases exceeded the levels attained in the previous season.

CEREALS

Wheat.—The 1962-63 wheat *grain* harvest of 109,002,000 bushels was the highest ever achieved in New South Wales, being 30,652,000 bushels greater than in the 1961-62 season and 13,775,000 bushels greater than the previous record achieved in 1947-48. Production in an Australian State has not previously exceeded 100,000,000 bushels. Yield average was a record 21.8 bushels per acre. Overall quality was better than that of the previous season, when approximately a quarter of the grain delivered to the Australian Wheat Board was classed as off-grade wheat.

Production of wheaten *hay* in 1962-63 was 123,160 tons, compared with 115,660 tons in 1961-62.

The acreage sown for all purposes totalled 5,242,000, comprising 5,008,200 acres for grain, 85,400 for hay and 148,400 for green fodder. Both the total acreage and the area sown for grain were the highest since 1947-48. The total acreage was the fourth from highest on record, while the area sown for grain was only exceeded in 1930-31 and 1947-48.

This record wheat harvest was the fourth successive heavy crop. It was thought earlier that the carryover could be quite considerable, but marketing arrangements have proved satisfactory and there is every indication that there will be no more than a normal carryover into the next season.

Oats.—The oat *grain* harvest of 16,035,000 bushels was well above the 1961-62 production of 13,225,000 bushels, and fourth from highest on record. Yield average was 22.7 bushels per acre. Oaten *hay* production amounted to 93,100 tons, compared with 81,100 tons in 1961-62.

Of the 1,343,400 acres sown for all purposes, 707,800 were sown for grain, 65,100 for hay and 570,500 for green fodder.

Barley.—The barley *grain* harvest was a record 5,361,000 bushels, considerably greater than the 4,136,000 bushels produced in 1961-62. Yield average was 24.3 bushels per acre. The 253,700 acres sown for all purposes was the highest ever, while the area sown for grain was a record 220,500 acres.

Maize.—In 1962, the grain harvest reached 2,145,100 bushels from a sown area of 46,500 acres; in 1961 the harvest was 2,349,000 bushels from 51,400 acres.

Grain Sorghum.—The harvest in 1962 was 1,890,800 bushels from 80,200 acres. Both production and acreage were records. In 1961, production was 1,307,500 bushels from 70,100 acres.

Rice.—Preliminary figures indicate production of approximately 133,000 tons in 1963, a record. Production in 1962 was 132,100 tons. The area under rice reached approximately 54,930 acres, also a record, and yield average was 2.42 tons per acre.

CITRUS FRUIT PRODUCTION

Citrus crops were very heavy for the second year in succession. Production was the highest ever achieved. At 5,465,000 bushels harvested it slightly exceeded the previous record of 5,261,000 bushels produced in 1961-62.

MEAT PRODUCTION

Preliminary figures indicate that production of beef and veal in 1962-63 was approximately 260,000 tons; mutton and lamb production approximated 198,000 tons; and pigmeat production approximated 30,500 tons. Comparative production figures for 1961-62 were 233,600 tons beef and veal, 196,800 tons mutton and lamb, and 32,700 tons pigmeats.

Beef and veal output was the second highest ever achieved by the State. It was surpassed only in 1958-59. Mutton and lamb output was also a record.

DAIRY PRODUCTION

Factory butter production in 1962-63 amounted to 35,968 tons, about 8 per cent below the 1961-62 output of 38,993 tons. Production of factory cheese during 1962-63 was 5,303 tons, about 11 per cent below the record production of 5,953 tons achieved in 1961-62. Milk production in the Milk Zone, approximately 155,600,000 gallons, was about 2 per cent above the 1961-62 output of 152,752,000 gallons.

EGG PRODUCTION

Commercial egg production in 1962-63 amounted to 54,609,000 dozen, about 11 per cent below the high output of 61,656,000 dozen in the previous season.

WOOL

Deliveries of wool from the 1962-63 clip into the main New South Wales stores at Sydney, Newcastle and Goulburn during the 12 months ended June, 1963, totalled 1,519,415 bales. Total receipts during the 12 months, including the carryover from the previous season and wool received for sale, were 1,611,260 bales. Of these, 1,545,265 bales were sold. After excluding 61 bales shipped abroad for sale during the season, 65,934 unsold bales were held in store at the end of June.

In each case, the figures were slightly lower than those for the previous season but due to higher prices received the total value of the wool sold amounted to £115.2 million as compared with £106.8 million in 1961-62.

Livestock Numbers

Sheep.—At the end of March, 1963, sheep in New South Wales totalled 70,021,000; some 523,000 more than in March, 1962, but still 979,000 less than the record of 71,000,000 in March, 1960.

Sheep numbers rose to 54,666,000 and lambs to 15,355,000. The proportion of lambs marked (19,960,000) to ewes mated (26,827,000) was 74 per cent.

Cattle.—Cattle in New South Wales at the end of March, 1963, reached a record total of 4,569,000; some 170,000 more than the previous record of 4,399,000 in March, 1962. The increase was due to further expansion in the beef cattle numbers. These increased by 180,000 to a record 3,307,000.

Dairy cattle numbers in commercial dairies fell by 10,000 to 1,122,000, while other milking cows remained static at 140,000 as compared with the position in March, 1962.

Pigs.—The number of pigs in New South Wales at the end of March, 1963, was 392,000, a decrease by almost 80,000 as compared with the previous year.

Meetings of the Australian Agricultural Council and Standing Committee on Agriculture

The Australian Agricultural Council met twice; at Perth in July, 1962, and at Melbourne in February, 1963. Four meetings of the Standing Committee on Agriculture were held; at Perth in July, 1962, at Canberra in October, 1962, at Melbourne in February, 1963, and at Brisbane in June, 1963.

Some of the major items discussed were: wheat, honey, and egg stabilisation plans; inspection of export grains; margarine legislation; cotton and tobacco production; renewal of dairy industry extension grant; pesticides in agriculture; aerial agriculture; tertiary agricultural education; swine fever; domestic rabbits; tractor testing; and meat marketing and research.

Farrer Memorial Trust

The Trustees of the Farrer Memorial Research Scholarship Fund held an annual and three ordinary meetings.

The Annual Farrer Memorial Oration for 1962 was delivered at the Annual Congress of A.N.Z.A.A.S., held at the University of Sydney in August, 1962, by Dr. O. H. Frankel, Executive Member, C.S.I.R.O., and formerly Chief of the C.S.I.R.O. Division of Plant Industry. His subject was "The Social Responsibility of Agricultural Science". The Oration was published in the January, 1963, issue of the *Australian Journal of Science* and a synopsis was published in the January, 1963, issue of the *Agricultural Gazette of N.S.W.*

Dr. Frankel was presented with the 1962 Farrer Memorial Medal in recognition of his distinguished service in agricultural science.

Mr. H. R. M. Ross was appointed a non-official trustee, vice Mr. A. Pickering, resigned.

The accounts of the Trust were audited and found satisfactory by the Auditor-General of N.S.W.

Royal Botanic Gardens and Government Domain Trust

One meeting of the Royal Botanic Gardens and Government Domain Trust was held. Matters discussed included a number of proposals for provision of additional car-parking facilities in various parts of the Domain, and a proposed memorial to Lieut.-General Sir Leslie Morshead at the entrance to the Botanic Gardens.

Finance—Summary

Consolidated Revenue Fund Expenditure and Receipts.—Expenditure from the Consolidated Revenue Fund in 1962-63 totalled £4,757,619. This included £1,038,321 for cattle tick control on the North Coast, and £140,944 for upkeep of the Royal Botanic Gardens and Admiralty House; each of which expenditures is in part recouped from the Commonwealth Government.

Further details in support of that C.R.F. expenditure, and of expenditures by other Government Departments on behalf of the Department of Agriculture, are shown in the Public Accounts tabled in Parliament each year as an accompaniment of the Report of the Auditor-General.

Receipts from all sources, totalling £1,253,284, are shown in detail later in this report (*Appendix I*—The Accounts of the Department of Agriculture, 1962-63).

Capital Works.—Capital works to the value of £210,832 were constructed and a loan programme of £200,000 has been prepared for 1963-64. Details of loan works expenditures during 1962-63 are shown in *Appendix I*—The Accounts of the Department of Agriculture, 1962-63.

Towards the end of the year under review, a grant of £30,000 was received for the relief of unemployment. This sum also was expended on capital works.

Trust Funds.—The provision of funds by industries, by semi-government sources, by Commonwealth Government grants, and by specialised taxations have shown a marked upward trend in recent years. Substantial components of the research programmes have been financed in this way, and findings have been extended to the man on the land and others with the help of special Commonwealth grants (*vide* "Commonwealth, Extension Services Grant" and "Commonwealth, Dairy Industry Extension Grant").

Expenditure from such grants or trust accounts is handled through the "Special Deposits Accounts" at the Treasury and regulated by Act of Parliament or such direction as may be given by the donor body, to whom the Department of Agriculture must account at the close of each financial year.

Some of the more important aspects of Special Deposits Account operations are given in *Appendix I*—The Accounts of the Department of Agriculture, 1962-63.

Commonwealth Grants for Dairy Industry and Agricultural Extension Services

Of the Dairy Industry Extension Grant amounting to £250,000 per annum made to the States by the Commonwealth, to assist extension services in the dairying industry, the annual allocation to New South Wales was originally £64,880 per annum. This grant commenced in 1948 and has been renewed at five-year periods. It was due to terminate on 30th June, 1963. Officers of the States and the Commonwealth Department of Primary Industry met and recommended continuance of the grant for a further five years, to 30th June, 1968, and that the amount be increased by £100,000 to £350,000 per annum. The Commonwealth agreed to the recommendations. From this sum New South Wales will receive £89,000 annually.

Of the Commonwealth grant to the States for Agricultural extension services in general, apart from the dairy industry extension grant, New South Wales receives £75,000 per annum.

This £75,000 Commonwealth Extension Services Grant and the £89,000 Commonwealth Dairy Industry Extension Grant provide for the New South Wales Department of Agriculture, from the Commonwealth, £164,000 per annum for agricultural extension—additional to what is provided by the State from the Consolidated Revenue Fund.

Dairy Industry Extension Grant Range of Projects.—The projects conducted by the Department with funds provided by the Commonwealth Dairy Industry Extension Grant in 1962-63 were as follows:—Grade Herd Recording, Field Assistants for Extension Officers, Publicity, Survey of Infertility in Dairy Herds, Survey of Efficiency of Milking Machines, Sire Survey in Artificial Breeding, Testing Station for Air-Flow Meters, Farm Demonstrations, Punch Card Equipment for Grade Herd Recording, Agricultural Trainees at Universities and Colleges, and an overseas visit by the Chief, Division of Dairying.

References to the projects and/or their effect are incorporated in the reports of the various Divisions of the Department affected by them, and a detailed Report on the whole has been prepared for the Commonwealth Government.

Agricultural Extension Services Grant Range of Projects.—The projects conducted by the Department with funds from this Grant in 1962-63 ranged over:—Provision of Field Assistants and Transport, Publicity Officers and Publicity, Agricultural Trainees at Universities and Colleges, Extension Aids Equipment, Books and Publications, Establishment of Demonstration Projects concerned with Pastures, Field Crops, Fruit Production, Livestock Production, etc.

References to the projects and/or their effect are incorporated in the reports of the various Divisions and Sections of the Department affected by them, and a detailed Report on the whole has been prepared for the Commonwealth Government.

Industry Funds for Research

Producers in the wheat, wool, dairy, beef and tobacco industries are providing, by levy, funds for research. The Commonwealth is contributing to the respective Industry Trust Account an amount about equal to that collected by the compulsory levy on produce sold.

Of about £3½ million allocated from various industries and subsidised by the Commonwealth, this Department is now receiving between £150,000 and £200,000 annually.

It has been stipulated that the industry funds are not to relieve State Treasuries of their normal responsibility to finance research, and the Department is spending in addition to the industry funds an amount of about £½ million annually on research.

About 150 officers are engaged almost full time on research work.

Wool Industry Research Committee Funds, 1962-63 Allocations.—This fund is derived from a per bale levy from growers and a per bale contribution by the Commonwealth. It is assumed that the newly constituted Australian Wool Board will in future accept responsibility for or take over the Wool Research Committee.

Whilst the overwhelming proportion of the £2½ million per annum fund is still being spent by the C.S.I.R.O., the Committee has recently recognised the need for additional regional and adaptive research and has increased the proportion of its allocations to State Departments.

The importance now attached to application of research findings is implied by the fact that this Department has three extension officers whose salaries were from Wool Funds for a period of three years. These sheep and wool officers, at Wentworth, Broken Hill and Brewarrina, have now been absorbed into the State's services. The new programme of fleece measurement, for selection of stud merino rams, employing three sheep and wool officers, is another example of attention to the application of research findings. The Department's Trangie Agricultural Research Station does the actual fleece measurements.

The Department's allocation from the wool research funds were distributed as follows: to Trangie Agricultural Research Station projects—£6,000 for the project "Fleece measurement for selection of stud merino rams," £1,780 for the project "Efficiency of wool production," £1,500 for the project "Galvanised Burr control with pastures," to Glen Innes Agricultural Research Station—£5,700 for the project "Sheep breeding and pasture management, relative to efficiency at several stocking rates, and superphosphate levels (Shannon Vale)," to Bathurst Experiment Farm—£2,500 for the "Ser-rated Tussock control" project; to the Inverell research project concerned with "Black Soil Scarab," £1,200 for a field assistant; to the Glenfield Veterinary Research Station project "Control and biology of itchmite in sheep," £1,450; to the Entomology Branch project "Insecticide resistance in sheep blowflies," £1,600; a total of £21,730.

In the case of Shannon Vale Station an allocation of £8,000 was made in 1960-61 for special improvements to enhance its research potential, and the N.S.W. Treasury later matched this by allocating £8,000 for further development.

Wheat Industry Research Committee Funds, 1963-64 Allocations.—Under the Wheat Tax Act wheatgrowers are levied on all wheat delivered to the Australian Wheat Board. The funds are available for wheat research programmes approved by the State Wheat Industry Research Committee. In addition, Commonwealth contributions are provided up to a maximum of £1 for £1 against wheat tax collections and these funds are available for expenditure on research programmes as recommended by the Wheat Industry Research Council (see later paragraph).

This Department has received allocations from these funds for 1963-64 as follows:—To the Agricultural Research Institute, Wagga, for several projects, "Genetic analyses of maturity" (£1,800), "Agronomic Survey Unit" (£5,300), "Soil fertility by improved pastures" (£1,100), "Breeding of improved varieties for irrigation areas" (£2,200), "Laboratory equipment and dehydrator" (£3,000), "Microscope for geneticist" (£500), "Two officers to attend genetics symposium" (£1,200), "Brabender mill" (£950), "Skeleton Weed research" (£700); to "Wheat research in the Central West" (£10,000); to Tamworth Agricultural Research Station for "Insulation and refrigeration of cold room" (£1,200) and "Mechanism of frost resistance in wheat" (£650); to the Entomology Branch for "Black Soil Scarab" project (£500); a total of £29,100.

To this total there may be added £3,191 for Soft Wheat Research.

Wheat Industry Research Council Funds, 1963-64 Allocations.—The Council distributes funds made available by the Commonwealth on a £1 for £1 basis (see previous paragraphs). Much of its allocation goes to a more basic and less regional type of research, e.g., £13,000 per annum for skeleton weed research has been allocated mostly to a C.S.I.R.O. study of the ecology of the plant.

This Department has received 1963-64 allocations as follows: to the Agricultural Research Institute, Wagga, a "Scholarship for wheat genetics studies overseas" £1,500, for a glasshouse £1,500; to a Tamworth Agricultural Research Station project "Photoperiod and temperature (cold resistance and winter wheats)" £3,746, and for cereal chemistry equipment £5,000 (part of £19,000 required); and to the Chemistry Branch for a wheat-grading survey £3,560; a total of £15,306.

Australian Dairy Produce Board Funds, 1962-63 Allocations.—Under the Dairy Produce Levy Act a per pound of butter levy and a per pound of cheese levy are paid by dairy farmers on all butter and cheese produced in Australia. The Commonwealth makes a contribution of half the expenditure on approved projects, with a maximum contribution on a £1 for £1 basis against funds raised by the levy. Obviously, the research is directed primarily to help producers in the butter and cheese areas.

This Department received 1962-63 allocations as follows: to Wollongbar Agricultural Research Station projects concerned with "pasture species research" (£6,700), other pasture and animal research (£8,628), a socio-economic survey of the dairy industry on the far North Coast (£5,770), and for an "Efficiency of detergents" project (£2,150); a total of £23,248; the total amount allocated to continued departmental and university research at Wollongbar was approximately £27,000; and to Hawkesbury Agricultural College for dairy manufacturing research projects—"Manufacture of Blue Vein Cheese" £3,425, "Composition of milk" £4,025, and "Bacteriophage antibiotic interactions" (Rydalmere) £3,000; a total of £10,450; in all, a total of £33,698.

The entire salary and travelling expenses of the Department's Supervisor of Dairy Industry Research (North Coast) are paid by the Dairy Produce Board. The far North Coast is seen as a trial research area and the Board's interest was largely responsible for the North Coast Research Council coming into existence—with the Department's Supervisor of Dairy Industry Research as Chairman.

Australian Cattle and Beef Research Committee Funds, 1962-63 Allocations.—The Trust Funds are raised by a per beast levy imposed for all cattle slaughtered for human consumption which weigh greater than 200 lb. dressed weight or over 220 lb. for carcasses with the skin on. As in the case of other funds provision is made for the Commonwealth to contribute £1 for £1.

This Department received 1962-63 allocations as follows: to Grafton Experiment Farm projects—"Pasture species investigations with particular reference to summer legumes" £5,680, "Phosphate levels in North Coast soils with specific relation to summer legumes" £3,190; to Glen Innes Agricultural Research Station projects—"Winter nutrition on the northern tablelands" £6,540; to Tamworth Agricultural Research Station projects—"Major and minor element deficiencies in beef area soils" £4,040; to Leeton Agricultural Research Station projects—"Pasture intake and digestibility studies—production of more beef per acre on irrigated pastures" £4,070; to a Head Office study of the nature and organisation of the Australian Beef Cattle Industry £2,550; and to Trangie Agricultural Research Station project—"Beef Cattle Improvement through breeding methods" £7,440; a total of £33,510.

Tobacco Industry Trust Account and Allocations 1963-64.—All manufacturers are levied per lb. on all leaf purchased and growers are levied per lb. on all leaf sold. The N.S.W. Tobacco Advisory Committee assists the Central Committee by drawing up research recommendations for this State.

This Department received 1963-64 allocations as follows: for Glen Innes Agricultural Research Station expenses of current research at Glen Innes and adjacent tobacco-growing areas £24,000, and for Ashford the purchase of an area and initial equipment of a new Tobacco Experiment Farm £32,000.

A suitable property has been selected and a contract will be signed as soon as the survey of the area is completed.

Funds Residue from Potato Marketing Board.—£11,000 became available on the winding-up of the Potato Marketing Board. Making use of this, an area has been selected in the Orange district for establishment of a Potato Research Station. It will be used largely to produce elite seed and for other potato research in the central west. The land is in the process of rededication for use as a research station.

Wheat Industry Stabilisation Fund (disposal).—An amount of £266,000 remained in a fund established in the late 1930's to help wheatgrowers in marginal wheat areas. It has become available for expenditure on research and extension by State Departments of Agriculture. The N.S.W. share of this is £117,961 and is available for control by this Department once projects have been approved by the Minister for Primary Industry. Thought and inquiry are proceeding to ensure best possible use of this fund.

Other Industry Funds.—The Department is receiving also from several other sources some funds not obtained as the result of legislative action.

The Banana Research Advisory Committee gives rise annually to a fund of £2,000 from the Banana Growers' Federation and £1,000 from the Committee of Fruit Direction in Queensland. These amounts are subsidised £1 for £1 by the Commonwealth. Approximately half is received by New South Wales. Its share is spent at the Tropical Fruit Research Station at Alstonville on the banana ripening problem.

From the Rice Investigations Committee, several thousand pounds have been contributed as needs have arisen, for salaries and equipment for rice research by the Leeton Agricultural Research Station.

Developments at Agricultural Colleges

The Agricultural Colleges Advisory Committee has now held four meetings. Some of its recommendations have been implemented, and others are being considered.

DEVELOPMENTS IN THE DIPLOMA COURSES

"Deferred" Examinations System.—Examination pass standards have been raised, and "deferred" examinations for each year in each of the three Diploma courses have now been formalised in keeping with the system at other tertiary institutions.

Grading of Passes.—Steps have been taken to introduce as from 1963 a grading system (Distinction, Credit, Pass, Fail) in final examination results. This is in lieu of actual marks.

English Expression Course.—A series of 30 lectures in English Expression commenced during the 1963 second term. It is for First Year students in each Diploma course.

Supervisor of Practical Training—new position.—To improve the effectiveness of practical work, the establishment of a full-time position designated Supervisor of Practical Training has been approved. The position, at each College, may be filled before the commencement of the 1963 third term.

Curricula Changes and Entrance Standards.—Certain changes in the curricula and in entrance standards, including the entrant selection method will not be fully implemented until 1966. That will be the first year of intake of students who have followed the new secondary school syllabus.

Possible Post-graduate Course.—A suggestion that Hawkesbury College provide a post-graduate/post-diplomate course in Agricultural Extension is receiving attention.

In-service Training for Lecturers.—The lecturing staff completed a 20-hour in-service course in Teaching Methods in 1962. There will be from time to time refresher lectures on specific aspects of teaching.

MORE FACILITIES AT WAGGA AGRICULTURAL COLLEGE

New Accommodation Block.—Completion of the new 64-room accommodation block permitted enrolment of 49 new students in 1963, an intake record. The number of students in residence rose to 109; in excess of 100 for the first time since the College was founded.

New Mechanic Shop and Farm Engineering Instruction Building.—These buildings have been added. They make automotive and general engineering trades instruction available to the students.

The Farm Certificate Course, Yanco

In this the first year of the one-year Farm Certificate Course, accommodated at Yanco Agricultural Research Station there are 38 students. There were more than a hundred applicants.

Further development of accommodation and training facilities proceeded this year, to provide for an intake of 54 students in January, 1964. Provision has been made for further expansion of this new educational centre, to permit 100 to be enrolled when in 1965 the training course enters the third year of its existence.

Some Developments Affecting Field Crops and Pastures

WHEAT: EXPANDED SOWING OF NEW VARIETIES

Departmentally-bred new wheat varieties Heron and Falcon were sown on a greatly expanded acreage in central and southern New South Wales in 1962. Each gave an outstanding performance in terms of field characteristics and yield. In the north-west there was a big increase in acreage of the new varieties Gamanya and Mengavi. Their yields were in general very high, despite there now being field strains of stem rust which can attack these varieties.

A NEW WHEAT VARIETY "RAVEN" RELEASED

A complex hybrid with a wide range of resistance to disease, has been released under the name Raven. Raven was derived by backcrossing with Dirk 48 as the recurrent parent. The new variety should do well in South Australia but for New South Wales conditions needs incorporation of some measure of frost tolerance.

WHEAT: GENETIC ANALYSIS OF DEVELOPMENT

Following demonstration of a simple mode of inheritance of a vernalisation response in spring wheats, further studies have revealed a monogenic control of day length response which differentiates between the wheats of Canada and those of Australia.

Genetic and physiologic studies of growth and development in wheat are being intensified at the Agricultural Research Institute, Wagga. These should make possible a much more direct approach to breeding for adaptation to the Australian environment.

PESTS OF STORED GRAIN

General acceptance of the developed method of treating wheat with a premium grade malathion spray as the grain enters storage has made feasible the implementation of new Exports (Grain) Regulations. The Regulations require all export wheat to be certified free of infestation and the ship to be cleaned before wheat is loaded.

HYBRID GRAIN SORGHUM DEVELOPMENT

Hybrid grain sorghums comprised one third of the State's grain sorghum acreage, indicating a rapid changeover from use of open-pollinated varieties. Yields of over 100 bushels per acre were obtained from some crops.

In trials, hybrids Tx610 and Brolga were the outstanding yielders for sorghum areas.

A hybrid grain sorghum Seed Certification Scheme operated for the first time in this State.

TO EXPEDITE RELEASE OF NEW PASTURE PLANTS TO COMMERCE

A Herbage Plant Liaison Committee was established in New South Wales by inter-institutional agreement. This Committee is representative of the C.S.I.R.O., Universities, Soil Conservation Service, Department of Agriculture and the seed trade. By co-ordinating seed production with the final stages of field assessment it will facilitate the orderly and expeditious release of new pasture varieties to commerce.

SEED PRODUCTION OF DESIRED SUMMER LEGUMES

Intensive research extending over twelve years has indicated several summer growing legumes of likely great value to north coast milk and beef producers. The seed is not available commercially, and their utilisation depends on development of seed supplies.

Seed industry interest in the plants has this year resulted in a commercial production of 4,000 lb. of *Glycine javanica*, and 1,000 lb. of *Desmodium uncinatum*. Seed areas of *Lotononis bainesii* have also been established, but not yet harvested.

WHOLE-FARM "FEED-YEAR" DEMONSTRATIONS

Three whole-farm demonstrations have been established in the Lismore area, following the excellent results at Wollongbar Agricultural Research Station. The Station's pilot investigations utilised the naturalised Kikuyu pasture as the base, and supplemented this with subterranean clover, vetches and *Glycine javanica* to improve nutritional levels at specific periods of the year.

The three whole-farm demonstrations now established on private properties and under economic as well as agronomic study, will indicate problems likely to be encountered in putting the research findings into commercial practice, and enable accurate assessment of the economics of the proposed feed-year programme.

NEW POTATO RESEARCH STATION AT ORANGE

Land has been acquired near Orange for an Agricultural Research Station that will be used mainly for potato investigations.

Funds of the former N.S.W. Potato Marketing Board, about £11,000, will meet the early costs of developing and equipping the Station.

Besides research into cultural techniques, nutrition, storage practices, culinary quality, and control of diseases, insect pests and weeds, "elite" high quality and disease-free seed will be produced for use by certified seed growers.



The Developing Industry—Cotton Growing

This commercial crop at Wee Waa produced 3,000 lb. seed cotton per acre. From 201 acres in 1960-61 and 1,956 acres in 1961-62, the New South Wales cotton acreage increased to 2,600 acres in 1962-63 and will be 10,000 acres in 1963-64.

NEW POTATO VARIETY "KURREL" RELEASED

A seedling developed at Glen Innes Agricultural Research Station was named and released for commercial production.

The new variety is Kurrel, from a cross between Sequoia and 11-79. It is late maturing, white-skinned, with field resistance to early and late blight, and produces a high yield of attractive uniform tubers.

COTTON: SPECTACULAR GROWTH OF INTEREST

Rarely has a crop here attracted as much interest as cotton has in the past year. There has been a great number of inquiries from prospective growers. American interests already have invested capital in the new industry. Several experienced Americans have already settled in New South Wales to grow cotton. Their knowledge of cotton growing has been of considerable assistance in this the third year of commercial production.

So that the new cotton industry may be soundly based, the Department continues to stress that economic production depends on irrigation.

Further reflecting the widespread interest, many comprehensive inquiries have been received from commercial firms, spinners, textile manufacturers, financial institutions, and other interested parties.

In addition to research and extension work already being conducted, a departmental officer was sent to the U.S.A. for twelve months' study of American production and extension methods.

LINSEED: RENEWED INTEREST

There has been notable renewal of farmer interest in oil crops and, as one that can substitute in a wheat rotation, linseed in particular.

Surveys by district agronomists have indicated that not less than 20,000 acres were sown to linseed in New South Wales during the autumn of 1962. It was a bigger acreage than at any other time in the past decade.

TOBACCO: PROGRESS TOWARDS A RESEARCH STATION

Lower returns for tobacco leaf resulted in less money available to the Tobacco Industry Trust Account from growers and manufacturers. In this light, members of the N.S.W. Tobacco Advisory Committee reopened the matter of establishing a Tobacco Research Station at Ashford. However, the Commonwealth Minister for Primary Industry has affirmed that there would be continuing finance for efficient staffing and maintenance of the Station.

Plans are now well in hand for the purchase of the site and establishment of this Station. The site is about 14 miles from Ashford, N.S.W.

NOXIOUS PLANTS INVESTIGATION COMMITTEE FORMED

During the year the Government set up the Noxious Plants Investigation Committee to investigate all aspects of the control and eradication of noxious plants, with particular reference to financial and administrative aspects. The Shires Association of New South Wales, Department of Local Government and Department of Agriculture are represented. The Committee has met on a number of occasions and made visits to the central west, the southern tablelands, the Western Division, and to Victoria and South Australia re border aspects of administration.

The Committee submitted a preliminary report dealing with the allocation of additional funds to councils for noxious plant control. Investigations relating to the border aspects of administration have not been completed.

Some highlights from the information so far collated are as follow:—

About £190,000 was spent on noxious plant control in 1961.

Expenditure by individual Shires ranged from nil to £4,565.

Expenditure by County Councils, on a per Shire basis, ranged from £1,040 to £5,100.

Average expenditure for all Shires was £1,430 (in 1961), including a grant which averaged £300.

Forty-three Shires spent over £1,000 on weeds and the eight County Councils in total spent £84,000; however, sixty Shires spent less than £1,000; only thirty-eight full-time weeds inspectors were employed; and sixty Shires did not carry out any regular inspections.

Following the preliminary report of the Committee, funds were made available to selected Councils for control of five dangerous weeds: Noogoora Burr, St. John's Wort, Serrated Tussock, Skeleton Weed and Groundsel Bush. In the allocation of these funds, special efforts were made to co-ordinate the programmes of adjoining districts, and in particular for control of St. John's Wort and Noogoora Burr in the Murray and Murrumbidgee watersheds.

SERRATED TUSOCK: AERIAL TREATMENT OF NON-ARABLE AREAS

There were important developments in research and the application of research results, using aerial techniques on non-arable Serrated Tussock areas. The large-scale trials established in the previous year resulted in 80-90 per cent kills of Serrated Tussock, and were followed by highly successful establishment of pasture species by seeding and top-dressing from the air. This line of research has been further developed in the current season.

It is pleasing to record that seven landholders in the central tablelands applied aerial spraying to 225 acres early this year, even though the technique is still in its infancy.

Spot spraying of Serrated Tussock was also undertaken far more extensively by landholders, particularly in the central tablelands. There, about 4 tons of 2,2-DPA was used by landholders, as against 5 cwt. in the previous year.

Some Developments Affecting Fruit Industries

NEW GRAPE VARIETY "NYORA" RELEASED

"Nyora", derived from a cross made in 1937 at Yanco Agricultural Research Station, has been released. It shows excellence as a dessert type. This is the first Australian-bred variety of grape.

TRAINING CLASSES ON FRUIT PACKING AND PRESENTATION

Serious shortage of skilled pome fruit-packers has led to extension of the special campaign to help correct the situation. The Fruit Packing Instructor and local staff conducted special three-weeks' classes at Orange, Batlow and Bathurst, and 240 persons completed the courses. Also, thirteen packing demonstrations were given, at various places, and a great deal of tuition was given to fruitgrowers by individual contact. This project will be further intensified next season.

NEW FRUIT CONTAINERS

Examination of new containers for fruit has continued. The banana industry has accepted a smaller, 1-bushel container, which has potential either in wood or fibreboard. The industry has requested the gazettal of a further type of 1-bushel container, to accommodate a pack of single bananas. This is a revolutionary step in the banana industry.

CAMPAIGN ON NEMATODES IN VINE ROOTLINGS

Because of widespread occurrence of nematodes in vineyards in the Murray irrigation districts, all vine rootlings raised by nurseries in the area are now examined by fruit inspectors before they are sold, and infested rootlings must be heat treated under departmental supervision. During the last planting season a total of 480,000 rootlings was involved in the inspections.

STRAWBERRY INDUSTRY REVIVAL

Signs of revival of the strawberry industry in this State are apparent. They have followed the release of a new variety bred by this Department and the introduction of improved production methods. Near to 60,000 plants of the new variety, Kendall, are being planted by commercial growers this season, and thousands also by home gardeners. Further varietal improvements are proceeding.

BETTER CONTROL OF SCALE INSECT PESTS

Red Scale.—M.I.A. citrus growers made a more concerted effort last season, following new Departmental recommendations of dimethoate-oil or ethion-in-oil sprays. The resultant control has been good. Also, reports from other areas throughout the State have indicated notably improved scale control through the new recommendations.

White Wax Scale.—The results of experiments with carbaryl-oil or Imidan-oil against white wax scale on citrus have been outstanding, in a season when control was difficult and grower results with other sprays were rather unsatisfactory.

San Jose Scale.—Growing-season sprays of carbaryl-oil against San Jose scale on deciduous fruit trees have given very promising results. They offer a notable advance in control of this important stone and pome fruit pest.

Excellent results were obtained in trials against woolly apple aphid with the systemic organophosphorus insecticide vamidothion, and full season control followed single sprays on trees in which reinfestation from the roots had previously made satisfactory control possible only by a succession of spray applications. Almost equally good control was achieved with vamidothion applied either by air blast or hand spray equipment. This represents a considerable advantage to apple growers in saving time and labour.

COMMODITY TREATMENT AGAINST FRUIT FLY

The successful work on ethylene-di-bromide fumigation as a commodity treatment against Queensland fruit fly in oranges has been terminated. Favourably affecting orange export prospects, the New Zealand Government has approved the method in principle.

Fumigation trials with lemons, mandarins and grapefruit have now been commenced, and also a co-operative project involving a cold storage treatment of pears. The goal of an acceptable quarantine commodity treatment for pears would allow export of this fruit to the U.S.A.

Some Developments Affecting Livestock Industry

SHEEP BLOWFLY, INSECTICIDAL RESISTANCE STUDIES

Extensive studies in the Entomology Branch have shown that sheep blowfly *Lucilia cuprina* remains susceptible to diazinon following laboratory insecticide pressure on dieldrin susceptible and resistant flies, and on field strains. The fly has also remained susceptible to diazinon following pressure from field treatment for five years. Some 80 field strains were subjected to test during the past fly season, for indications of diazinon resistance. No such resistance was noted.

Field experiments also showed some other insecticides to be effective for control of fly strike. There is more detail in the Entomology Branch, Division of Science Services section of this Report.

QUALITY IN THE DEPARTMENT'S DAIRY HERDS

The highly satisfactory production by Departmental herds was shown by the records of the Official Herd Recording Scheme and the Breed Societies Annual Production Competitions. The "Top Jersey Herd of the Year" Award was won. The honour of "Class Leader" was won by four Jerseys, two Guernseys and one Ayrshire. The Guernsey herd won for the fourth year in succession the William Newcombe Cup, being the herd with the six highest Guernsey records.

DISPERSAL OF AYRSHIRE STUD

During the year the old established Ayrshire Stud at Bathurst Experiment Farm was dispersed. The herd was established near the end of last century and has been under continuous Herd Recording for 45 years. With regret, its dispersal became necessary because of the need for expansion of the City of Bathurst.

THE SWINE FEVER CAMPAIGN

The swine fever eradication measures have achieved a favourable, general position in New South Wales. It has not been necessary to slaughter-out any herd since November, 1962, and only two properties have been under suspicion in the six months to 30th June, 1963. In these two cases, no filterable agent has been found in material from sick or dead animals.

Whilst the position is viewed with optimism, how long it might continue favourably cannot yet be foreseen with certainty. It is under vigilant surveillance. About 7 per cent. gel reactors occur in pigs sampled when going through abattoirs. Whether any of these gel reactors are actual carriers of the virus has to be ascertained. Detailed examination of some of the reactors is proceeding.

It is not unreasonable to assume that a low-virulence, low-infectivity virus might be introduced to a herd and sensitize some of the pigs, and then die out or remain to continue sensitizing a few animals—without producing any noticeable morbidity or mortality.

FLEECE MEASUREMENT SERVICE FOR STUD BREEDERS

The Fleece Measurement Service based on Trangie Agricultural Research Station was inaugurated in February, 1963, with the help of Wool Industry Research Trust funds. Three field officers and a laboratory attendant were specially appointed for the project.

From July, 1962, to January, 1963, some 670 samples from 24 studs had been received at the Station and processed; a rate of activity comparable with that of the preceding year. However, from February to May, 1963, some 1,600 samples from 24 studs were received and processed by the newly established Fleece Measurement Service staff.

Field work by the Fleece Measurement Service in the four months to 31st May, 1963, included 707 stud rams fleece-weighed and sampled, 1,273 stud ewes fleece-weighed, 2,800 flock ewes fleece-weighed, and 102 sale rams shoulder-sampled.

The Fleece Measurement Service has had an overall favourable response. Further extension work by District sheep and wool officers promises still greater use of it, by all districts.

The "Yass Valley Project" and Yass Valley Organisation (Y.V.O.)

BACKGROUND INFORMATION

In 1957 the New South Wales Department of Agriculture and C.S.I.R.O. entered into a co-operative agreement to study the Southern Tablelands of N.S.W. as a basis for future research and extension planning. A Joint Planning Committee was appointed to conduct the project.

It was decided to study the Yass River Valley as a pilot area. C.S.I.R.O. undertook responsibility for defining natural resources, and reports were produced on water resources, climate, plant nutrients, and soils. Department of Agriculture undertook a survey of the agricultural situation, as it was in 1957.

The Joint Planning Committee realised during 1960 that the scope for further collations of information was becoming more limited, and that if productivity was to be raised this would be done by farmers themselves, on their farms. The Joint Planning Committee was expanded by adding three representatives of farmers organisations.

In late 1960 a conference at Canberra considered and approved a case for appointment of a special officer to undertake "Operation Tintacks". This is an exercise in applied research, aiming to infuse, with profit, results of research into actual farm management programmes. The special officer position became that of the Yass Project Officer and the appointment was made by a secondment from C.S.I.R.O. Agricultural Liaison Service to the Department of Agriculture, both bodies sharing the expenses. This appointment dated from 1st August, 1962.

The Joint Planning Committee meanwhile sponsored the inauguration of the Yass Valley Organisation (YVO), a body having representatives from all the relevant government departments, landholders' organisations, and local professional and business interests. The decision to inaugurate YVO was taken at a public meeting in Yass, 28th June, 1962.

"OPERATION TINTACKS"

The reports of the Joint Planning Committee provided a wealth of information from which improvements in farm management programmes could be deduced. There is however a natural reluctance on the part of landholders to implement new ideas until they have seen them in operation. The Committee's efforts therefore were hampered through lack of a suitable testing ground.

A further difficulty was the complexity of the soils of the Yass Valley—they vary so much over very short distances that no soil map of the usual type showing named soil types can be produced. As a result, specialists in conference are unable to be clear on just what farm situations they are discussing.

From these difficulties has developed the idea of Operation Tintacks—to get down to tintacks on one piece of land, to define precisely its makeup, and to integrate into the farm management programme those ideas which the Joint Planning Committee's reports and other research results indicated were suitable to raise productivity.

Operation Tintacks then was to proceed in three stages:—

A complete "appreciation" to be written of the resources of the selected farm.

A farm management programme to be written including where possible new ideas gleaned from the various surveys made in the Yass Valley.

The programme to be put into effect by the landholder using his own resources under an agreement between the landholder and Y.V.O.

This concept, introduced by the Joint Planning Committee, was adopted by the Yass Valley Organisation which which appointed an Operation Tintacks Sub-committee (6 landholders, 2 bankers, 2 accountants, 2 departmental officers).

The Department of Agriculture appointed a Yass Project Technical Committee to assist the Yass Project Officer and advise on the course of the project.

Events in 1962-63.—The Inaugural Meeting of Y.V.O. was held in July, 1962, and amongst the sub-committees appointed was that of Operation Tintacks.

In August the Operation Tintacks Sub-committee met to consider the 13 farms offered. It divided the area into five. No offers had been received from farms in two of these. An Investigation Committee was appointed.

By October, selection had been narrowed down to two farms in each of the three zones; these six farms were inspected by members of the Technical Committee. Three properties were recommended for acceptance, and the Executive of Y.V.O. endorsed the three farms selected. The Soil Conservation Service undertook to prepare maps of the farms (W. G. McClung's, Murrumbateman; T. Frost's, Bowning; and L. Walmsley's, Yass River).

By February, 1963, the first drafts of the farm "appreciations" were presented to the Technical Committee, which suggested further material to be included. Later in February the three owners were added to Operation Tintacks Sub-committee. The Sub-committee also considered reports of inspections made of further farms offered, and recommended two in the additional two zones of the Yass Valley for further investigation. The Technical Committee inspected and approved of these two properties.

In March, members of Operation Tintacks Sub-committee, the Technical Committee, and numbers of co-opted specialists (27 persons in all) inspected the first three farms. Later, 16 of these presented written reports suggesting various subjects for inclusion in the new farm management programmes.

In April, the Investigation Committee reported to the Sub-committee on its inspections. The property of G. G. Walmsley, Bellmount Forest, Gundaroo, was recommended and the Executive of Y.V.O. accepted G. G. Walmsley's property. That of I. J. & B. M. Evans, Geary's Gap, was recommended for further discussion with the owners.

A small "Farm" committee was appointed for each farm to assist the Yass Project Officer in drawing up plans and budgets.

By May, the Farm Committee had made three drafts of plans and budget for W. G. McClung; the Third Draft, with some alternative proposals, and incomplete as to interest on overdraft, taxation, and return to capital had yet to be added. It was approved by the Sub-committee and passed to the Executive of Y.V.O. The Executive approved the Third Draft in principle, noting where it was incomplete, and passed it on to the Technical Committee asking for comment.

Since then, the 4th and 5th Drafts of the McClung report have been considered by the Sub-committee.

A second draft of a partial budget for L. Walmsley's has been presented.

It has been decided that a field day will be held on Mr. McClung's on 14th August and on Mr. Walmsleys in mid-October.

The Technical Committee has finally approved of G. G. Walmsley's and urged that Mr. Evan's property be included if possible. The report on Mr. McClungs has been approved in principle.

Complete budgets are to be prepared for all farms, as soon as possible.

Personnel and Staff Branch

SECTIONS COMBINED AS ONE BRANCH

Following on an Organisation and Methods Survey of the Personnel Section and the Staff Section the two were combined as Personnel and Staff Branch, under the control of an officer designated Administrative Assistant and Personnel Officer. Formerly Chief Clerk, Mr. S. Wise took up duty in this position on 17th December, 1962.

STAFF SECTION

Work in the Staff Section was to some extent re-organised. An Assistant Staff Clerk was appointed. Staff Records files were transferred from Head Office Records to where the Staff Section is located. Accommodation jointly occupied with the Personnel Section was re-organised to provide better working conditions.

PERSONNEL SECTION

Officers and employees taking up duty through Head Office were suitably inducted.

University and College Trainees.—Thirty-six University traineeships were awarded at the beginning of 1963, tenable at the Universities of Sydney, New South Wales and New England. The new trainees attended a ten-day Induction School at Bathurst prior to commencing the University year. They attended also an Effective Reading Class, later in the year.

Twelve traineeships tenable at Hawkesbury and Wagga Agricultural Colleges were also awarded at the beginning of 1963.

Currently there are 160 Department of Agriculture trainees at the various Universities and Agricultural Colleges. The total includes eight who are repeating an academic year at personal expense.

Tutorials for P.S.B. Examinees.—Classes were organised for Regulation 116 and 119 examination candidates. Field Officers were advised in their preparation for the Regulation 124 examinations. Study material was made available to all candidates.

Study Leave.—This was arranged for officers' part-time University and Technical College studies.

Counselling and Adjustment.—Advise and guidance were provided for a number of officers. In certain cases they were referred to specialist officers of the Public Service Board.

First-aid Service.—The service was continued at Head Office, and provision of first-aid equipment at country institutions was supervised.

Colombo Plan and F.A.O. Fellows.—Facilities were organised within the Department for study groups and individual Fellows from India, Indonesia, Thailand, Southern Rhodesia, Tanganyika, Korea, Nigeria, Pakistan, Syria, Libya and Mauritius.

Career Inquiries.—Information about careers in agriculture was provided for career advisers, parents, students and interested organisations.

STAFF CHANGES AND MOVEMENTS

Appointments/Promotions.—Mr. A. D. Mears, Supervisor of Training, Farm Certificate Course, Yanco Agricultural Research Station; Mr. W. E. Plunkett, Assistant Legal Officer, and Registrar, Veterinary Surgeons Board; Mr. F. A. Vernon, Principal Dairy Officer (Extension); Mr. C. E. Chapman, Principal Dairy Officer (Herd Improvement); Mr. D. W. Crowfoot, Principal Dairy Officer (Miscellaneous Duties); Mr. E. G. McLaren, Principal Dairy Officer, School of Dairy Technology, Hawkesbury Agricultural College; Mr. R. W. Robertson, Senior Inspector, Export and Import Branch; Mr. R. Howe, Deputy Senior Inspector, Export and Import Branch; Mr. B. F. Atkins, Deputy Principal, Hawkesbury Agricultural College; Mr. R. C. Cramp, Principal Veterinary Officer (Meat Inspection); Mr. P. Brydon, Assistant Principal Veterinary Officer (Meat Inspection); Mr. J. Keogh, District Veterinary Officer, Wagga; Mr. J. R. Sutherland, Deputy Principal, Wagga



Asian Study Group at Cowra Experiment Farm

The Department and the Commonwealth Education Office continued to collaborate in providing study programmes for Colombo Plan and F.A.O. Fellows from Asian countries.

Agricultural College; Mr. W. R. Turner, Editor of Publications; Mr. E. M. Matheson, Senior Research Officer, Tamworth Agricultural Research Station; Mr. S. W. Wise, Administrative Assistant and Personnel Officer; Mr. D. McGregor, Officer-in-Charge, Correspondence and Records Branch; Mr. J. B. Owen, Senior Inspector of Accounts.

Retirements.—Mr. R. J. K. Synnott, Editor of Publications; Mr. C. B. Campbell, Personnel Officer; Mr. W. McCarroll, Deputy Principal, Hawkesbury Agricultural College; Mr. L. T. Bilbe, Senior Inspector, Export and Import Branch; Mr. K. D. McGillivray, Senior Fruit Officer.

Deaths.—Mr. D. J. Wooding, Biometrician; Mr. F. S. Oldham, Senior Fruit Officer; Mr. B. J. Hall, Agronomist; Mr. S. J. Cragg, Senior Meat Inspector.

Departed for Overseas.—Mr. L. A. S. Johnson, Botanist, Sydney Royal Botanic Gardens, was appointed as Botanical Liaison Officer at Kew Gardens, England, for two years. He departed on 18th August, 1962, and travelled via the U.S.A. and Canada to examine material in North America Herbaria and to attend the Montreal Conference of Biosystematists.

Mr. A. K. Potts, Dairy Officer, was seconded to the Australian Dairy Produce Board for a period of two years from 1st February, 1963, for duties concerned with Philippines production of re-combined milk from Australian raw materials.

Mr. A. C. Orman, Deputy Chief, Division of Plant Industry, proceeded overseas for six months from 31st May, 1963. He is on extended leave, but for a short period in New Zealand would be on duty to study seed production techniques.

Returned from Overseas.—Mr. R. R. Schulze, Agronomist, resumed duty on 22nd April, 1963, after twelve months' study of cotton production in the United States of America.

Mr. B. D. Swann, Agronomist, resumed duty on 11th January, 1963, after completion of his scholarship at the University of California.

Visited Overseas.—Dr. C. J. P. Magee, Chief, Division of Science Services, attended as a member of the Australian Delegation the U.N. Conference on Science and Technology at Geneva in February, 1963. He spent also several days in the U.S.A. on his return journey, to observe latest developments in the de-salination of water.

Mr. R. M. Watts, Chief, Division of Animal Industry, attended as a member of the Commonwealth Delegation the F.A.O. Conference on Pesticides in Agriculture at Rome in November, 1962. He proceeded also to England, to confer with U.K. veterinary authorities.

Mr. A. C. Small, Chief, Division of Dairying, attended as a member of the Australian Delegation the 16th International Dairy Congress, at Copenhagen, Denmark, in September, 1962. He made observations also on improved dairying practices in the U.K. and on the European continent.

Mr. C. A. Hawkins, Chemist, Division of Science Services, was Departmental representative at the Congress of the International Society of Soil Science, at Massey College, Palmerston North, New Zealand, in November, 1962. He took also the opportunity to discuss with N.Z. Department of Agriculture officers their methods for mass production of advisory soil analyses.

Staff Numbers at 30th June, 1963

	Public Service Board	Ministerial	Totals
Central Administration*	579	6 (1)	585
Division of Science Services	142	..	142
Division of Plant Industry	180	..	180
Division of Horticulture	153	..	153
Division of Dairying	178	..	178
Hawkesbury Agricultural College	72	89 (2)	161
Wagga Agricultural College	31	63 (3)	94
Experiment Farms and Stations	177	207 (4)	384
Division of Animal Industry—			
Head and District Offices	256	12	268
Meat Inspection Service	156	19	175
Queensland Border	58	1 (5)	59
Tick Quarantine Areas	46	509 (6)	555
Royal Botanic Gardens	135	2 (7)	137
Totals..	2,163	908	3,071

* Includes Division of Marketing and Agricultural Economics and the Division of Information Services.

(1) Includes 1 casual; (2) Includes 18 casuals; (3) Includes 1 casual;
(4) Includes 14 casuals; (5) Includes 1 casual; (6) Includes 1 casual;
(7) Includes 2 casuals.

Legal and Registration Branch

ACTS PASSED

Dairy Industry (Amendment) Act, 1962.—Special provisions to regulate manufacture or preparation of margarine in New South Wales have been included in the Dairy Industry Act, 1915, as amended, since 1940. Regulation of such manufacture or preparation is effected by a licensing system embodied in the Act. This specifies the quantity of table margarine that may be manufactured by the holder of each table margarine license during a particular year ending on the 30th June. It also fixes 9,000 tons as the total quantity of table margarine that may be specified in the aggregate for all table margarine licenses issued for any such licensing year.

The Dairy Industry (Amendment) Act, 1962, made numerous amendments to the special provisions under review. Those amendments primarily aim to help control and enforce the restrictions on manufacture of table margarine. Consistent therewith the Act has:—

extended and clarified the powers of the Minister and inspectors in many relevant respects;

imposed specific obligations on margarine manufacturers concerning production or supply of books, records, documents and information;

deemed statements made by certain classes of officers and employees of any company manufacturing margarine prima facie to have been made with the authority of the company and to be admissible in evidence against the company in certain proceedings instituted against it under the Dairy Industry Act;

enabled regulations to be made prescribing books and records which shall be kept by manufacturers or distributors of margarine;

increased relevant penalties and consequences thereof;

increased the time allowed for institution of prosecution proceedings relating to any alleged manufacture in excess of the quantity or quota specified in a table margarine license; and

made other provisions consequent upon and ancillary to the foregoing.

Plant Diseases and Irrigation (Amendment) Act, 1962.—This Act amends the Plant Diseases Act, 1924, as amended, and the Irrigation Act, 1912, as amended. It is expressed to commence upon a day to be appointed by the Governor and notified by proclamation published in the *Gazette*. The main object is transfer of power from the Irrigation Act to the Plant Diseases Act, to provide for control of plant diseases within irrigation areas and for prohibition or regulation of movement of plants, fruits, etc., into such areas on account of disease.

However, many other amendments are included in the Plant Diseases and Irrigation (Amendment) Act, 1962. Some of these are mainly matters of drafting but there are also several substantive amendments. These are designed to:—

require vehicle drivers to stop same at or near State boundaries or specified portions thereof when an inspector displays a prescribed sign;

enlarge inspectorial powers for entry and search of land, premises, vehicles, etc.;

establish as offences—(a) failure to comply with requirements of an inspector, (b) failure to state name and place of abode if found committing or reasonably suspected of having committed an offence against the Act or Regulations, (c) personation of an inspector and (d) possession of any prohibited plant, fruit, package, etc., which to the possessor's knowledge was illegally brought into the State;

provide expressly that proceedings for offences against the Act or Regulations shall be disposed of summarily; and

enact certain evidentiary provisions designed to help prove offences of the kind specified and prove appointment of inspectors.

Cattle Compensation (Amendment) Act, 1962.—The Cattle Compensation Fund established by the Cattle Compensation Act, 1951, provides finance for compensation to owners of cattle destroyed in certain circumstances because of a disease within the scope of the Act, and to owners of cattle carcasses condemned at an abattoir because of any such disease. Maximum compensation payable from that Fund for any one head of cattle is fixed by section 6 (1B) of the Cattle Compensation Act, 1951, as amended.

The sole purpose of the Cattle Compensation (Amendment) Act, 1962, was to increase such maximum amount of compensation from £36 to £50. The date of commencement of the Act was 1st January, 1963.

Cattle Compensation Taxation Act, 1962.—Finance for the Cattle Compensation Fund established by the Cattle Compensation Act, 1951, is derived from:—

(1) a stamp duty per head of cattle, in the amount fixed by a Cattle Compensation Taxation Act and thereunder imposed upon the person on whose behalf cattle are delivered to an abattoir for slaughter, and

(2) a special rate per head of cattle, fixed as to amount by regulation and levied annually by Pastures Protection Boards upon stockowners in respect of cattle owned by them at 31st December.

Prior to commencement of the Cattle Compensation Taxation Act, 1962, the stamp duty per head of cattle and the special rate was one shilling and sixpence. The Cattle Compensation Taxation Act, 1962, reduced the stamp duty to one shilling. The date of commencement of the Act was 1st January, 1963. The special rate was reduced to one shilling by amendment of the appropriate regulation.

REGULATIONS, PROCLAMATIONS

There were 30 gazettals of Regulations, 50 Proclamations and 92 Notifications.

PROSECUTIONS

For offence under the various Acts administered by the Department 146 persons were prosecuted.

ARBITRATION—AGRICULTURAL HOLDINGS ACT, 1941

No matter was referred to arbitration under the Act. A decision is still awaited from a District Court Judge in respect of a stated case referred by a Committee to the Judge during the previous year.

REGISTRATIONS

Registrations effected during 1962-63 and those of 1961-62 are compared in this tabulation:—

	1961-62	1962-63
Apiary registration	3,965	4,240
Potato licences	1,975	2,207
Stock foods	1,526	1,606
Stock medicines	1,782	
Pest destroyers	1,712	1,829
Sheep brands	1,570	1,476
Sheep earmarks	1,869	1,659
Large stock brands	1,708	1,648
Fertilizers	643	633
Farm produce agents	280	294
Veterinary surgeons	451	474
Swine brands	2,829	942
Swine licences	305	131

Veterinary Surgeons Board

The Board met on 10 occasions.

The prescribed examination for veterinary graduates of overseas universities was held in September, 1962. Of the four candidates, none passed.

Stock Foods and Medicines Board

The Board registered 1,606 stock foods, a few more than in 1961-62. It also registered 1,660 therapeutic and prophylactic agents.

Acting on an agreement between the Commonwealth and States to limit application of chlorinated hydrocarbons to sheep and cattle, because of a toxic residue problem affecting human health and export trade, the Board now declines to accept applications for registration of such insecticides. Also, for human health reasons the Board now declines to register oestrogens for growth promotion or caponizing.

Architect Branch

Loan and C.R. Funds Expended.—For new and maintenance works the expenditures were: Loan funds, £210,832, Consolidated Revenue funds (including Western Division Public Watering Places), £132,531, Special Grants, £14,183, and Unemployment Relief Vote funds, £26,613.

Work Completed.—This comprised: erection of a general store and agronomy shed at Hawkesbury Agricultural College; completion of a honey house, erection of student and mechanic instruction shops, electrical extensions, irrigation works and water supply at Wagga Agricultural College; re-roofing of Manager's cottage, toilet and septic tank installation at packing shed and greenhouse repairs at the Tropical Fruit Research Station, Alstonville; completion of garages and workshop and extension of cattle stalls at the Cattle Tick Research Station, Wollongbar; painting of three cottages and repairs to roof of stables at Bathurst Experiment Farm; erection of hayshed at Cowra Experiment Farm; completion of toilet and septic tank installations and renovations to crusher shed at Condobolin Experiment Farm; completion of extensions to laboratories at Glenfield Veterinary Research Station; re-roofing at Quarters, renovations to cream room and a calf shed and also machinery shed at Grafton Experiment Farm; erection of men's amenities and alterations to Manager's cottage at the Viticultural Research Station, Griffith; alterations and repairs to No. 3 cottage at Leeton Agricultural Research Station; completion of a packing shed and improvements to water supply and reticulation at the Agricultural Research Station, Dareton; renovations and painting of Quarters, also extensions of electricity, at the Experiment Station, Narrabri; re-roofing and renovation of office building, erection of store shed, toilet and septic tank installations, and construction of a 10,000 gallon water storage tank in concrete, at the Horticultural Research Station, Narara; and, at the Somersby Section of that Station, toilet and septic tank installations.

A prefabricated steel hayshed and sewerage improvements were provided at the Agricultural Research Station, Glen Innes; a prefabricated steel work shed was erected at Shannon Vale Nutrition Station; a brooder house and extensions of electricity were provided at the Poultry Research Station, Seven Hills; the agronomy shed was extended and the Manager's house painted and renovated at Temora Experiment Farm; an office at the beef cattle section, extensions to the shearing shed, construction of wool drying racks, and erection of a cottage and garage comprised the works at Trangie Agricultural Research Station; shower facilities were provided and a maize shed erected at Tamworth Agricultural Research Station; a calf feeding shed, a multiple garage for farm vehicles, alterations and additions to the agronomy shed, an additional piggery building for feeding, and alterations to laboratories were provided at Wollongbar Agricultural Research Station.

At Yanco Agricultural Research Station the works comprised erection of a fruit packing shed, a mechanics shop and student instruction shop, laundry and toilet block alterations, reconstruction of the blacksmith's shop and the sports shed, alterations to the office block, verandah enclosures on cottages, erection of a fruit colouring room, and of garages at two cottages, erection of two cottages, and electricity extensions.

Work Still Proceeding.—This includes at Wagga Agricultural College the dormitory block, alterations to the Graham Block, erection of a shed for soil testing purposes, a poultry slaughter house, and stables and loose boxes for the horse section; erection of a cottage at Ashford; erection of office and laboratory block at the Cattle Tick Research Station, Wollongbar; improvements to office accommodation, toilet block, and also the bathroom in the Manager's cottage, at Bathurst Experiment Farm; extensions to the cutter shed at Grafton Experiment Farm; erection of a maize shed at the Agricultural Research Station, Glen Innes; completion of sheep yards and improvements to water storage and reticulation at Shannon Vale Nutrition Station; erection of the agronomy shed, construction of frost-research chamber and glasshouse and also painting of Manager's cottage at the Agricultural Research Station, Tamworth; improvements to water supply and reticulation at the Agricultural Research Station, Wollongbar; and erection of an Administration Block at the Agricultural Research Station, Trangie.

Maintenance Work.—This comprised painting and repairs to cottages and/or farm buildings at: Alstonville Tropical Fruit Research Station; Condobolin Experiment Farm, Cowra Experiment Farm, Grafton Experiment Farm; Griffith Viticultural Research Station; Narara Horticultural Research Station; Glen Innes Agricultural Research Station; Shannon Vale Nutrition Station; Temora Experiment Farm; Tamworth, Trangie, Wollongbar, and Yanco Agricultural Research Stations; Glen-

field Veterinary Research Station; and at the Queensland Border. Desilting of tanks, construction of concrete storage tanks, and erection of equipment on Public Watering Places proceeded in the Western Division.

Extension Services.—Enquiries concerning building problems were attended to by letter or personal interview. Plans representing buildings to the value of £191,100 were supplied to farmers.

Pastures Protection Section

RABBIT CONTROL

Training Schools' and Field Day Effect, on P.P. Boards.—Over the past five years this Department has run 14 schools to train Pastures Protection Board field officers. These dealt with the technique of "1080" poisoning, the use of other rabbit control methods, approach to landholders, and farm management as applied to rabbit control methods generally. The schools have emphasised the desirability of service to landholders rather than mere policing of the Act and Regulations.

The schools have been successful to a point, but in some areas there has been conflict between progressive ideas put forward by rabbit inspectors and the ideas of P.P. Board Directors. To overcome this several field days for Directors of P.P. Boards have been organised and surprisingly well attended.

Not all Pastures Protection Boards have revised their outlook but there has been a great change. At least a third of the P.P. Boards have a much improved attitude towards rabbit control services. Many of the Boards now encourage their officers to *advise* landholders on rabbit control matters, in preference to enforcement by regulation, and have also purchased costly plant for use on properties where landholders do not have sufficient equipment.

Designation of "Rabbit-free" Areas.—During the last two years at the suggestion of this Department some P.P. Boards have designated certain parts of their District as "rabbit-free" areas. They have concentrated on achieving complete eradication within each area so designated. No Board has so far achieved its aim, but the policy has yielded a great deal of experience and greatly increased landholders' interest in rabbit control.

More Unit-Operators.—The number of rabbit inspectors employed by P.P. Boards did not increase this year, but Unit Operator appointments have increased. These operators are in charge of a landrover or tractor and allied equipment, to do work for landholders at a charge of about £1 10s. 0d. to £2 10s. 0d. per hour. A Board with this equipment and an experienced operator can guarantee high quality results, and in fact many cases of virtual eradication have resulted.

AUSTRALIAN PLAGUE LOCUST

A few flying swarms of plague locust were noted in the Bogan-Macquarie (No. 1) Outbreak Area in the autumn but the pest caused no serious damage in 1962-63.

To ensure ample insecticide on hand, 10,000 gallons of lindane has been stored at a depot at Dubbo. To store this insecticide, and micron sprays, a £1,500 shed was constructed.

TRAVELLING STOCK RESERVES

Further Reductions.—The Department's view is that travelling stock reserves throughout the State are in excess of travelling stock needs, and the P.P. Boards have voluntarily agreed to relinquish quite large areas. The Assistant Field Officer (Reserves) has visited 10 Districts this year and in each case gained the Board's agreement to further reduce its area of travelling stock reserves.

It was decided last year that where practicable there would be a general review in one series of inspections of all travelling stock reserves in a District; that at this time all surplus land would be withdrawn within that District and that the areas remaining would be only those needed for stock movement for some years ahead. Thus the P.P. Board would have tenure sufficiently secure to concentrate on improvements. Such a survey has been done in the Condobolin District and has proved very successful from the viewpoint of the P.P. Board and the Department. Large areas of unnecessary stock route were withdrawn and the Board is now concentrating on improving the areas remaining. Other Boards have signified their desire to have such a survey done.

Staff Statistics—Pastures Protection Boards

	Year ended	
	30th June, 1962	30th June, 1963
Veterinary Inspectors—		
Appointed	2	1
Resigned	1	1
Transferred	2	Nil
Secretaries—		
Appointed	1	7
Resigned	Nil	3
Retired	Nil	2
Dismissed	1	Nil
Deceased in Office ..	Nil	1
Rangers—		
Appointed	6	3
Resigned	4	1
Retired	1	Nil
Deceased in Office ..	Nil	1
Appointed Secretary	Nil	1
Rabbit Inspectors—		
Appointed	21	9
Resigned	2	6
Retired	2	1
Deceased in Office ..	1	Nil
Promoted to Ranger	1	2

INDUSTRIAL

New Award for Veterinary Inspectors.—The hearing of the application to the Industrial Commission was completed and a new award for Veterinary Inspectors handed down. It granted increases of £335 per annum to £525 per annum in the margins, retrospective to 1st July, 1962, and some minor alterations to the previous award.

Biometrical Branch

General.—The Branch provided advice to investigators in other parts of the Department on design of experiments, on analysis and interpretation of results, and on sampling and survey methods and related matters. At the start of an investigation, the biometrician helps to clarify and define objectives, to select the precise questions to which answers will be sought, and to decide the exact plans and procedure to be followed. On completion of experimental work he is again available, for mathematical-statistical analysis of the data obtained and to advise on interpretation.

The year provided a wide variety of subjects including: design of fertilizer and other experiments with field crops, pastures and fruit crops; animal nutrition experiments; sampling methods; selection of sites for experiments and size and placement of plots in the field. Statistical analyses of the results were done for numerous projects mentioned elsewhere in this Report of the Department. The volume of consultations on design of experiments, and of analyses of results, each increased. This reflected increased research establishment throughout the Department.

Punch Card Section.—This small Hollerith Unit has handled the records from Dairy Herd Recording and has produced lactation statements, sire surveys, herd summaries and annual State summaries of production statistics. These records will in future be punched on to cards in the Section but the processing of records and printing of documents will be done at the Public Service Board's A.D.P. Centre. Programming for the Honeywell computer commenced in March, 1963.

Research Liaison Office

Research progress is dealt with in the reports of the various Divisions and institutions covered by this Report of the Department. The Research Liaison Office has taken actions to expand and improve the efficiency of the Department's research work.

Several new research projects have been started largely with industry funds, and aimed at integration of plant and animal research programmes. Major problems of pasture establishment and maintenance having been solved in many districts, the immediate problem is one of greatly increasing the output of animal products therefrom.

Pasture management problems involve a study of both the plant and the animal and a major responsibility of the Chief Research Liaison Officer is to help bridge gaps which previously existed in this direction. Some pasture research workers are now largely controlling experimental animals and some animal workers are now more closely associated with pasture production for their research animals.

Increase in Research Staff.—Some new research appointments have been made possible by funds provided by industries: a chemist for soft wheat investigations, a research officer for irrigation wheat, agronomists for beef cattle investigations and for "cold" research in wheat. It has not yet been possible to fill the position of tobacco chemist for which industry funds were provided. Other research positions will be created from further funds more recently received.

New Research Projects.—The spread of new research projects registered during 1962-63 was as follows:—

Division of Plant Industry	10 major projects
Division of Animal Industry ..	22 major projects
Division of Horticulture	6 major projects
Division of Dairying	1 major project
Division of Science Services—	
Entomology	10 major projects
Chemistry	5 major projects
Biology	1 major project
Division of Marketing and Agricultural Economics ..	2 major projects
Total	57

Several of the new projects approved involved both capital and annual expenditure of several thousands of pounds. These have been made possible largely through funds provided by Industry Research Committees.

Ways and Means of Improving Research.—Submissions were prepared by Chiefs of Divisions, Heads of Branches and Research Directors, suggesting ways and means of improving the research work of the Department. Actions arising from subsequent discussions will be initiated shortly. These will include creation of four industry Research Programme Committees, dealing with wheat, cotton, beef and dairying. Each Committee will look over the problems of the respective industry and determine the problems likely to be amenable to solution by research.

As a result of suggestions made by this Department, the University of Sydney conducted a school on experimental methods, which was attended by some 20 Departmental research workers.

Better Co-ordination.—A Chemistry Review Committee is now effectively screening chemistry requests for analyses made to the Chief Chemist by Divisions of Animal Industry, Plant Industry and Horticulture. The Committee comprises the Chief, Division of Science Services, the Chief Chemist and the Chief Research Liaison Officer. The Chief of the production Division concerned is present during discussion of the respective programmes.

A conference of cereal breeders in this State and in Queensland, including those of the University of Sydney and the Wheat Research Foundation, was convened for the first time, at Tamworth. It was valuable in co-ordinating the research work in progress. It also considered the question of development of wheat breeding in the central west, a development that has been sought by farmers' organisations there. Subsequently an amount of £10,000 per annum for each of three years was allocated by the New South Wales Wheat Industry Research Committee for wheat research in the central west.

This allocation will allow the Department to start two research programmes, one associated with central western district testing of wheat strains bred at Wagga and Tamworth, and the other a study of the wheat nutritional requirements of the central west by Condobolin Experiment Farm and the Division of Science Services, Rydalmere.

Considerable activity has been directed towards the establishment of a phosphate advisory service for farmers in various parts of the wheat belt. To effect better co-ordination between the research workers of the Department, the C.S.I.R.O., and the University of Sydney, a Phosphate Committee, composed of active research workers in the three organisations has been brought into existence.

A two-day school on Planned Pasture Production was organised for district agronomists and district dairy officers in the Milk Board areas. This was a planned attempt to make use of research results achieved by the University of Sydney by channelling them through the Department's extension services to dairy farmers in Milk Board areas. As a result it is expected that each main district in the Milk Board areas will have at least one planned pasture demonstration.

Improved Facilities.—Plans have been completed and tenders will shortly be called for substantial additions to the Agricultural Research Institute, Wagga. Research accommodation has also been improved at Trangie and Leeton Agricultural Research Stations.

Publicity for Departmental Research.—The first issue of a new publication *Research and the Farmer* has been published. It dealt with research in the Southern Region and comprised articles from the Agricultural Research Institute, Wagga.

A Research Liaison Officer (Scientific Publications) has also been appointed, in Division of Information Services. He is to take up his duties on 1st July, 1963.

The Department has also co-operated closely with the C.S.I.R.O. in preparation of a publication *Soils and Pasture Research on the Northern Tablelands of New South Wales*. Arrangements have been made to obtain 9,000 copies of this publication, for distribution mainly in tablelands areas.

Assisting University Trainees.—The Trainee Orientation School, for the 1963 intake, again provided a valuable means of introducing trainees to the Department and their future opportunities to serve the farming community as Departmental officers. Also trainees in all University years were called for interview, at the end of 1962 and again early in 1963. On the later occasion they were assisted to make decisions regarding their University courses and their future placement within the Department.

EXPERIMENT FARMS AND STATIONS BRANCH

Scope

Technical subject matter work of the various Experiment Farms, Stations and Substations of the Department is covered in the reports of the Divisions of Plant Industry, Animal Industry, Horticulture, Dairying, and Science Services, the Hawkesbury and Wagga Agricultural Colleges and the Agricultural Research Institute, Wagga.

The Experiment Farms and Stations Branch is responsible for developmental and operational administration of:—

- eighteen Experiment Farms and Research Stations;
- the Farms at Hawkesbury and Wagga Agricultural Colleges and Glenfield Veterinary Research Station;
- plant and machinery for Division of Plant Industry;
- projects at Berry and Graman, and those needs of the Royal Botanic Gardens, Sydney, and Agricultural Research Institute, Wagga;
- a Farm Mechanisation Advisory Service;
- a limited agricultural machinery research programme.

Developmental Aspects

Major developmental activities this year were as follows.

Tropical Fruit Research Station, Alstonville.—The physical development recorded in 1961-62 has been supported by increased research staff and manpower and there is now a substantial research programme. Provision of water for proposed irrigation research is still a difficulty.

Experiment Farm, Bathurst.—Action was taken to reduce the operative size, operations and manpower. Research work was not reduced by this action. All fruit work will continue and can be expanded. Agronomy work is unaffected, except that vegetable improvement work was reduced for other reasons. Livestock breeding was discontinued.

Potato Research Station, Orange.—Steps were taken to establish a station at Orange for potato improvement work and elite seed production. Initial funds were available through termination of the Potato Marketing Board. The Station will centralise potato work now scattered over the central



Temporary Grain Silo, of Hessian and Steel Wire

This was to store grain sorghum. In keeping with the trend to greater conservation of fodder, grain reserves on farms are at a high level.

tablelands and partially the responsibility of Bathurst Experiment Farm. When the potato work is firmly established, the Station may be used also for other research.

Experiment Farm, Condobolin.—Further subdivision was done, additional modern plant was provided, and another grain storage shed and other buildings were erected, to improve conditions for research and to provide fodder for other institutions.

Horticultural Research Station, Dareton.—Irrigation equipment is being increased to meet expanding needs. A residence for the Officer-in-Charge and a fruit packing shed have been provided.

Agricultural Research Station, Glen Innes.—Preparations for initiation of beef cattle nutrition research have progressed, including extensive subdivision, sowing of improved pastures, a fodder storage shed, and an additional office and work room for search workers.

Shannon Vale Nutrition Station, Glen Innes.—In preparation for renewed livestock research the boundary fence was replaced, extensive subdivision was carried out, water supply was augmented and reticulation extended. The cottage was renovated, office accommodation was provided, shed storage was increased and new sheep yards were erected. Research programmes will commence shortly.

Experiment Farm, Grafton.—Maintenance work was substantial and office accommodation for professional staff was improved. Considerable expansion is occurring in "off the Farm" research into beef cattle management and nutrition.

Viticultural Research Station, Griffith.—Modern office and laboratory facilities to the needed level were provided. A research programme with emphasis on drainage problems is developing.

Agricultural Research Station, Leeton.—The administrative building was completed. It was officially opened by the Minister for Agriculture and Conservation on 29th March, 1963. Surrounds have been improved by sowing of lawns, shrubs and flower beds and by neat approach roads and paths. Structures and yards for livestock research were extended, or renovated. A water storage tank was excavated to provide supplies in the "off irrigation" period.

Horticultural Research Station, Narara.—Water supply and reticulation were expanded. Amenities were provided for personnel on both sections of the Station. The office was renovated and a new store was provided.

Experiment Farm, Narrabri.—Further progress included installation of an additional irrigation pump to augment the water supply for research crops.

Agricultural Research Station, Tamworth.—A dam for irrigation water storage was completed and a spray irrigation system was installed, to secure summer growing for wheat breeding. Sheds for professional officers and storage purpose, and a glasshouse, were erected. The shearing shed and yards were improved, including installation of a sheep dip.

Experiment Farm, Temora.—The stable was remodelled internally and a concrete floor laid, providing storage for machinery, fertilizer and bulk materials. Research office accommodation was increased.

Agricultural Research Station, Trangie.—A new beef cattle section was completed and outside paddock and shed installations have been planned. Water supply equipment was improved. A new administrative building and an additional staff cottage are under construction.

Agricultural Research Station, Wollongbar.—A building was provided for expansion of pig research. Laboratory facilities were improved. A garage was erected for Station vehicles and tractors. Buildings and yards were improved. Reclamation and improvements proceeded at Duck Creek Substation, including drainage, fencing and water reticulation.

Agricultural Research Station, Yanco.—Facilities were provided or improved at an expenditure of £54,000, to launch the 12 months' Farm Certificate Course officially opened by the Minister for Agriculture and Conservation on 29th March, 1963.

Improvements included erection of two more staff cottages, a mechanic's workshop, student training workshop, blacksmith shop and an orchard shed. The central office, dormitories, ablutions block, kitchen, dining room and quarters were renovated and in part refurnished.

Farm plant and equipment and educational materials were provided for student instruction. A Supervisor of Training, a Lecturer in Agronomy, a Farm Machinery Officer and a Mechanic were engaged to implement the Course.

Tobacco Research Station.—Negotiations are proceeding to purchase a station for tobacco research at Ashford.

Operational

The Branch was associated with expenditure of £48,000 (excluding farm labour cost) in maintenance, upkeep, extension and renovation of buildings, water supply, fences, roads, erosion control, structures, etc. at Experiment Farms and Stations.

Buildings.—Building maintenance, repairs, improvements and extensions were substantial at Alstonville, Bathurst, Condobolin, Grafton, Griffith, Leeton, Narara, Tamworth, Temora, Trangie and Wollongbar; and some work of this nature was done at all other Experiment Farms and Stations. In some cases the work was such that it has been reported under "Developmental Aspects".

The Architect's report mentions major works which were supervised by his Branch, but many minor repairs and considerable maintenance were done by the Farm or Station staff.

Fences.—For maintenance and additions £7,300 was allocated. The major work was done at Bathurst, Condobolin, Glen Innes, Grafton, Temora, Trangie and Yanco, but some was done at all establishments.

Roads.—Road repairs were effected at all Experiment Farms and Stations, with particular attention to the damage caused by recently constant wet weather. Major works included tar sealing of the entrance roads at Narara, Seven Hills, Glen Innes and Leeton, gravelling the drive at Grafton, resealing the drive at Wollongbar, and gravelling internal roads at Alstonville. Roads in the administration area at Bathurst were re-formed and gravelled.

Aesthetic Surrounds.—Aesthetic appearance of the establishments is a responsibility of the Managers as is the provision of windbreaks and shade. A lot of such work was done, notably at Condobolin, Dareton, Leeton, Narara, Narrabri and Temora. Over 1,000 trees were planted on these Stations. In some cases the trees have been labelled, for public information. At Leeton extensive gardens, lawns, shrubs, rosebeds, etc., were laid in the surrounds of the administrative building.

Soil Fertility.—Soil fertility maintenance is an integral part of the Managers' responsibilities. It continued to receive attention, through proper crop rotations, including pasture phases, and by green manuring in orchards. Improved pasture and lucerne increased in 1962-63 by more than 650 acres.

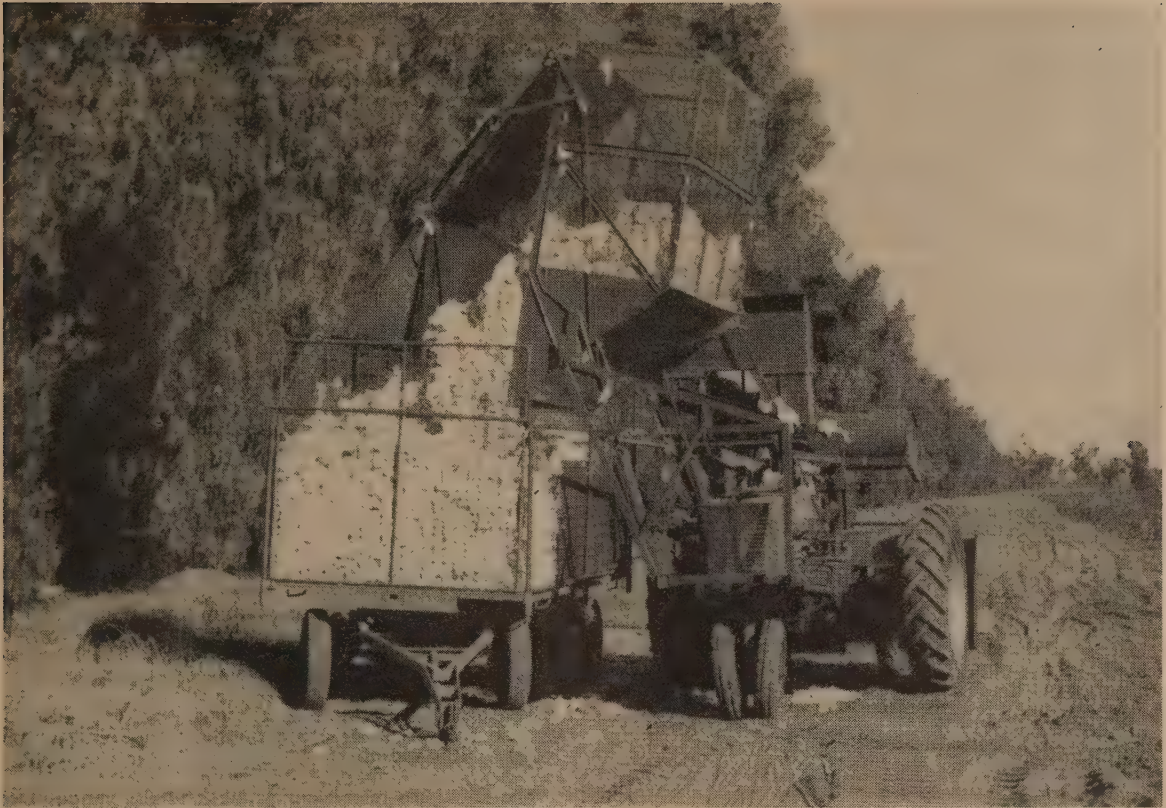
Property Security.—The bounteous season in the west brought heavy pasture growth in the spring, followed by constant attention to fire control measures. Floodings on the north and central coasts damaged the Grafton and Wollongbar establishments and led to abnormally frequent attention to maintenance and restorations.

General Maintenance.—General farm maintenance continued at all Experiment Farms and Stations, including erosion control structures and preparation of land for irrigation and drainage. The main drainage work was at Wollongbar (Duck Creek Section), Griffith, Alstonville, Narara and Leeton.

Irrigation.—Irrigation features apart from annual maintenance have been reported under "Developmental Aspects".

Fodder Production.—Fodder reserves had been heavily depleted in May, June and July, 1962. Even so, the institutions were also self-sufficient in grain and roughage fodder requirements, due to a good cereal harvest. Some Experiment Farms and Stations produced fodder in excess of their own requirements. The surplus was transferred to others. The estimated value of fodder transferred was £13,236.

At 31st May, 1963, the estimated total fodder stored on exporting Farms and Stations was 40,300 bushels of grain and 1,820 tons of hay. These reserves were greater than at 31st May, 1962; sufficient to meet the immediate needs and to feed stock for a lengthy drought. Estimated value of fodder in reserve was £50,000.



Mechanised, Cotton Bulk Harvest

This harvester at Jemalong Station near Forbes unloaded the seed cotton into a temporary bulk-bin, for subsequent baling by a wool press and transport to a distant ginnery. As yet, only Wee Waa district in the north west has established a local ginnery. The south west is organising for one.

Seed Production.—Most of the Experiment Farms and Stations engaged in seed production. As a whole they were virtually self-sufficient in cereal seed requirements. In addition, practically all fruit trees and vines needed for research were produced.

Livestock.—Considerable interchange of livestock occurred. Thus, excess production of some establishments reduced expenditure that deficiencies of resources on others would have caused.

Farm Machinery.—About £22,000 was spent on provision of plant, including: six tractors, eight scales, three disc ploughs and cultivators, three scarifiers, four threshers, three air-conditioners, two seed graders, two refrigerators, two grain silos, three dumpy levels, two post hole diggers, two orchard sprays, and a cultivator, irrigation pump, mower, slasher, rotary hoe, bale elevator, cotton gin, low loading trailer, hayrake, header seed drill and dehydrator.

The Branch acted in a recommending capacity for purchase of farm machinery needs at Wagga and Hawkesbury Agricultural Colleges, Glenfield Veterinary Research Station, and the Agricultural Research Institute, Wagga. Similar action was taken re items of plant purchased from Plant Industry Division funds and when requested by the Chiefs of the appropriate Divisions, from wheat industry, wool industry, tobacco industry and dairy industry funds, etc.

The Branch gave advice concerning rural mechanisation, agricultural machinery and plant to the Departments of Local Government, Technical Education, Education, Child Welfare, Prisons, Tourist Activities and Immigration, Conservation, Public Health and Government Stores, and to the Aborigines' Welfare Board, Electricity Commission, the New South Wales Milk Board, Housing Commission, University of New South Wales, Junior Farmers' movement and the Catchment Areas Protection Board.

Advice on rural mechanisation and farm machinery was also given to the Commonwealth Departments of External Territories, Civil Aviation, Trade and Customs, Taxation, Supply, and Primary Industry, the Commonwealth Statistician, Commonwealth Development Bank, C.S.I.R.O., and Standards Association of Australia, the British Trade Commission, New Zealand Trade Commission, Netherlands Council for Trade

Promotion, Canadian Trade Commission, New Zealand Manufacturers' Trade Delegation, representatives of the Thailand Government and United Nations and to Colombo Plan students.

Data for broadcasts was supplied to the Australian Broadcasting Commission, and some broadcasts were made by the Agricultural Engineer.

Motor Vehicles.—Seven new vehicles were supplied for Experiment Farms and Stations.

The Experiment Farms and Stations Branch has the responsibility of recommendations for replacement of old vehicles on Experiment Farms and Stations and also of taking delivery of and checking all vehicles supplied to the Department. The Chief, Experiment Farms and Stations Branch, is a member of the Department of Agriculture Motor Vehicles Committee.

Labour.—Allocation of regular and casual labour for efficient conduct of the Farms and Stations was supervised by the Branch. During the year, the Public Service Board directed also that all Field Assistants at Research Stations shall be responsible to the Chief of this Branch. There are about 60 of these officers.

Farm Mechanisation Advisory Service

Progress was made in development of this relatively new service. Public awareness resulted in increased activity by the Agricultural Engineer and the two Agricultural Machinery Officers. One of the latter is in the South Western Region (headquarters Leeton), and the other in the Western Region (headquarters Orange). Applications have been called to fill another Agricultural Machinery Officer position, for the Southern Region (headquarters Wagga Wagga).

The Agricultural Engineer in Extension Services.—The Agricultural Engineer has spent considerable time in establishing the Agricultural Machinery Officers in their Regions and keeping them posted with information. He also tendered advice by correspondence, telephone and personal discussion, and engaged in other extension works:—

- published three Department of Agriculture booklets;
- issued 37 news items;
- attended 14 field days and machinery demonstrations;

organised five tractor maintenance schools and participated in one short term school for industry;
gave 20 addresses to farmers and prepared material for four more;
gave seven broadcasts and one TV segment;
wrote four articles for extension journals;
adjudicated the Junior Farmer State Championship for the Tractor Maintenance and Operation Project;
attended six meetings and seven committee meetings in connection with the farm machinery trade; and eight agricultural conferences.

Engineering Content of College Courses.—The Agricultural Engineer completed revision of the Agricultural Engineering Section of the curricula of the Agriculture Diploma Courses at Hawkesbury and Wagga Agricultural Colleges in association with College lecturers, and served on the Examination Committee for each College.

Considerable time was spent in planning buildings and equipment for Yanco Agricultural Research Station and Wagga Agricultural College Engineering Schools.

Agricultural Machinery Curriculum for Secondary Schools.—The Agricultural Engineer served in the Committee revising this curriculum, in association with Department of Education officers.

Agricultural Machinery Officer in South-Western Region.—His work included direct farmer contacts, machinery dealer contacts, radio broadcasting, and accumulation of data on machinery used within the Region. He closely studied machinery for cotton growing, a new crop, with district agronomists and the Regional economics research officer. The object of the study is to keep costs to an economic level.

His extension activities included:—

- 265 farm visits;
- 38 broadcasts;
- 20 lectures at short term schools;
- six talks at farmer field days;
- nine lectures and two demonstrations in the Farm Certificate Course, Yanco;
- an article on machinery for cotton growing, distributed at four cotton field days attended by over a thousand farmers.

The number of farmers seeking advice on purchase of tractors in this Region is increasing, particularly among those setting up in the new irrigation area at Coleambally.

Vegetable growers with sufficiently large holdings have been encouraged to increase their mechanisation.

Advice was given to farmers on selection of sprinkler irrigation equipment, and on replacement of open ditches with asbestos pipes, and assistance was given in the design of a new type of delver which might reduce the price by half and be much more versatile than existing delvers.

Agricultural Machinery Officer in Western Region.—He was appointed in June, 1962, and took up duty at Orange in January, 1962. Early, much of his time was spent in the various localities to become familiar with the types of agriculture and to gather data about the most suitable types of agricultural machinery. Opportunity was taken to contact machinery dealers as well as farmers, and valuable information regarding machinery trends in the Region was obtained.

In addition to the office enquiries, this officer's extension activities included:—

- 90 farms and 24 machinery dealers visited;
- 13 radio broadcasts;
- 13 field days;
- talks at four short term schools;
- nine press statements;
- seven agricultural meetings;
- six meetings of the Orange National Field Day Committee;
- participation in preparation of three Departmental pamphlets;
- engineering drawings in association with other Departmental officers for a new type of individual sow feeding pen, a pig watering device, a movable pig house, a jetting device for cleaning milking machines, a phalaris seed harvester, a sheep loading ramp; each duplicated and then used in extension work in the Region.

Now that the service is becoming more widely known, there are increasing enquiries. This follows the same trend as that experienced in the South-Western Region.

Closure of Mobile School of Mechanisation.—In November, 1962, this unit which had been located in the Northern and North-Western Regions was closed down. This van, manned by a tradesman demonstrator, had served its purpose. A more comprehensive service is developing through appointment of Regional agricultural machinery officers.

DIVISION OF PLANT INDUSTRY

General

Staffing for Research and Extension.—In four years the services of fifty-two agronomists have been lost by secondments or resignations. Sixteen were experienced District agronomists.

Sub-division of at least twelve Districts is an urgent need but impossible until all existing Districts have an agronomist.

Three established extension Districts have long been vacant: Bathurst—vacant since April, 1957; Queanbeyan—vacant since July, 1961, and Wentworth—vacant since September, 1961; and a fourth, Goulburn, has been vacant since October, 1962. Finley District, formerly Berrigan District, had been vacant since March, 1955. It was filled in September, 1962.

Three Districts became vacant this year; two through resignations and one through a transfer. One of these (Goulburn) is still vacant.

The Division's research undertaken at the various Departmental research centres and in districts continued to increase. Additional trained research personnel are needed for it. Three graduates were recruited to the Division during the year and four were lost; one through death and one by resignation. There was thus a nett loss of one in research staff.

A research agronomist was appointed to Grafton Experiment Farm for pasture species investigations and plant nutrition work in the beef cattle areas of the north coast. Another was appointed to research on irrigated pastures at Narrabri Experiment Farm, and another to Head Office to assist the Uniform Pasture Survey and Extension Trials project.

In-service Development of Agronomists for Extension Duties.—A new programme to hasten and intensify in-service training of agronomists for extension service was adopted early in 1963. It will help to provide a future reserve of extension personnel to ensure that each established district is staffed continuously.

Agronomists who on appointment are destined as future extension workers will spend about two years on Research Stations. Whilst there they will be given opportunities to spend some time in the field with extension officers.

After this initial training period they will be located in an Agricultural Region, under a Regional Supervisor. Agronomists in training will not undertake advisory duties but by association with District agronomists and other Regional officers will engage in all forms of extension training. Personnel thus trained for a year should be in a sound position to accept the duties and responsibilities of a District agronomist.

Three agronomists have already commenced the year of Regional training. They are at Wagga, Goulburn and Orange, respectively. Two more will take up the training in July, 1963.

Other In-service Training.—To help District agronomists to be abreast of technical developments, provision continued for them to attend special schools, conferences and field days in various parts of the State, and to review work in adjoining States.

During the year a Residential Conference for District agronomists was held at Hawkesbury Agricultural College. Selected agronomists attended also the Commonwealth Extension Conference aimed at Australia-wide improvement of extension services. Others attended the Department's residential Extension Methods School, for training in extension principles and methods.

Research by the University of Sydney concerning planned dairy pasture production under irrigation having reached a stage where it can be applied in whole or in part to commercial production, a School on this was held for coastal agronomists in January, 1963. The extension officers have now programmed selected dairy farmers to use this system of pasture production. It will be modified to suit local conditions where necessary.

The Electricity Authority of New South Wales has been anxious that farmers should gain a better appreciation of the use of electricity on the farm. At the Divisional Conference an officer of the Electricity Authority addressed agronomists on power usages on farms. Co-operative work has been undertaken with the Authority.

Extension Activities.—The demand by farmers and organisations for District agronomist services continued to increase. Provision of a personal service to all farmers seeking advice has long ceased to be possible. To help solve this problem, group and mass methods through field days, meetings, radio and press releases have been further expanded.

In these twelve months District agronomists contributed sessions at not less than 237 field days and associated with farmers at many others. They also provide material at not less than 226 meetings. Most were night meetings.

The agronomists made 927 radio broadcasts, and 591 press releases. In addition, extracts from District agronomists' monthly reports on seasonal conditions and crop and pasture prospects were freely used by city and country newspapers.

Agronomists' Supervision of Registered Seed Production.—District agronomists supervised the sowing, reliability and harvesting of 402 Registered Seed production and other seed production areas on farmers' properties.

Farmer Experiment Plots and Demonstrations.—On farmers' properties District Agronomists conducted or were formally associated with a great volume of experiment plots and/or demonstrations, including:—Wheat, 104; oats, 43; barley, 17; maize, 42; sorghum, 13; cotton, 4; rice, 27; oil crops, 12; vegetables, 63; fodder crops, legumes, weeds, 123; and pastures, 622.

Competitions and Shows.—The Division assisted Country Show associations and the Royal Agricultural Society in the promotion and judging of field crop and whole farm competitions, and in judging agricultural sections at Shows.

Rural Advisory "Clubs".—Rural Advisory "Clubs" or "Groups" are increasing. There are now at least 13 functioning and several more taking shape. At present a major problem for a group coming into existence is to secure a competent, experienced Adviser.

A "Club" or "Group" is formed within a locality by a group of producers who want a regular personal advisory service, especially on aspects of management. A group typically comprises about 40 members. Annual operational cost, £4,000 to £5,000, is provided by the members.

Advisers freely use subject-matter advice and assistance of Departmental officers. As the "Club" movement expands, the Department will be increasingly called upon for that type of assistance. It is foreseen also that as the movement develops, the Department will become a training and recruiting source of "Club" Advisers. In the past year one agronomist resigned to become an Adviser to a Rural Advisory Group.

Regional Research Conferences.—Two Plant Industry Regional Conferences were organised, one held at Temora Experiment Farm and the other at Cowra Experiment Farm.

Plant Introductions and Exchanges

A total of 571 plant introductions was made during the year. In reply to numerous requests many samples of seed of crops and pasture species were supplied to other countries.

Industry Funds for Research

The increased funds from industry for research have enabled research projects to expand and new ones to be undertaken. These include:

Summer Legumes Research.—Grafton Experiment Farm had already made considerable progress towards the goal of suitable species for the numerous soil types in Grafton area. The Australian Cattle and Beef Research Committee has now provided funds for staff and mobile equipment to extend the

studies. An agronomist has been appointed. Large scale grazing trials have been established on beef raising properties that represent a range of climatic and soil conditions. The more thoroughly tested grasses and legume species are being used. Observational nurseries have been established in further areas such as Wollom Strip, Upper Clarence and Nymboida, as a first step to determine species suitable there.

Winter Nutrition of Cattle on the Northern Tablelands.—At Glen Innes Agricultural Research Station plans were drafted and paddock boundaries defined, to compare with pastures only the value of forages and fodders as a supplement to improved pastures. Eighty head of cattle for the experiment were purchased with funds provided by the Australian Cattle and Beef Research Committee.

Sheep Breeding and Stocking Rates, Shannon Vale.—Following provision of £8,000 from Wool Research Trust Funds in 1961-62, the N.S.W. Treasury agreed to meet it £ for £ for development of Shannon Vale Nutrition Station. A further sum of £5,700 for 1962-63 has come from the Wool Research Trust funds. The final plan of the Sheep Breeding and Pasture Management project has been drawn up. The paddocks were surveyed and fencing has been commenced, to prepare the trial area for topdressing of pastures.

Black Soil Scarab Research, Inverell.—The research agronomist engaged on black soil scarab research resigned during the year. He will not be replaced at Inverell, as further agronomic research there at present is unlikely to throw additional light on the situation.

The following results had been obtained:—

- Wheat growing is the best economic proposition in the black scarab areas. However, a rotation is imperative, to maintain soil fertility and disease and weed control.
- Lucerne is the most useful pasture plant, because of tolerance to scarab grub attack. The Hairy Peruvian strain is superior to others for the needs of this area. Lucerne has successfully established in surface seeding trials on non-arable country in the 1961 and 1962 winters.
- Other plants of value are *Sorghum almum*, lablab bean, cowpeas, sweet clover (Cumino strain) and *Phalaris*.
- There has been response to sulphur on lucerne-*phalaris* pasture; but the plant nutrition picture is complex. Phosphorus, molybdenum, zinc and boron may all be deficient in parts of the area.

Sulphur Institute Funds.—The Sulphur Institute, Washington D.C., U.S.A., contributed \$5,000 per annum initially for two years. This was to employ an agronomist, to compile and publish results from the Uniform Pasture Survey and Extension Trials. An agronomist has been appointed and the work is proceeding.

Land Settlement Services

Co-operation with Closer Settlement Advisory Boards in selection and design of Estates for closer settlement was co-ordinated by the Principal Agronomist (Extension). He also made final inspections of Estates being acquired for closer settlement. This year 13 Estates, total area 81,412 acres, were inspected by members of the Closer Settlement Advisory Boards in company with the Principal Agronomist (Extension).

District agronomists, and other extension officers when needed, also participate in the inspection of Estates, and in topographic surveys and farm designing. Their work this year included investigations leading to one Type "A" Report (preliminary inspection by District agronomist, 11,200 acres), and 24 Type "B" Reports (joint Agricultural/Lands Department inspections and reports) concerned with 10 Acquisitions (96,243 acres) and 14 Promotions (34,236 acres). Included in the foregoing were five Acquisition Estates, or parts thereof, designed for 31 closer settlement leases. In addition, five Estates or areas were inspected, for the purpose of special reports.

Twenty closer settlement leases held by former settlers were made available for ballot and were allocated. District agronomists will advise the successful applicants for development of the blocks.

In the Coleambally Irrigation Area the Griffith District agronomist co-operated with the Water Conservation and Irrigation Commission in design of farms. Thirty-six farms allocated have been brought into production. A further 27 farms allocated are being developed, and 34 more farms were balloted for in June, 1963. At the end of June, 1963, the total of blocks allocated had reached 158, including 151 large area farms and seven horticultural farms.

Fertilizer Trends

Fertilizer usage continued to increase.

Superphosphate sales by New South Wales manufacturers totalled 488,000 tons, plus purchases from Victorian and Queensland firms in border districts. It has been estimated that in all 550,000 tons of super were used in New South Wales. Since 1958-59 superphosphate usage has increased by 83 per cent from about 300,000 tons to 550,000 tons.

Of the 488,000 tons distributed from New South Wales sources, 257,000 tons (52.7 per cent) was in bulk, and 230,000 (47.3 per cent) was in bags. Since 1959-60 the usage of bulk superphosphate has increased by 114 per cent, from 120,000 to 257,000 tons.

Lime/superphosphate sales have increased by 42 per cent, and sulphur fortified 30/superphosphate by 20 per cent whilst 4,200 tons of the new sulphur fortified 50/superphosphate were sold.

Superphosphate remains the most important fertilizer but interest in other fertilizers, nitrogenous and potassic, is markedly increasing.

High analyses mixed fertilizers containing nitrogen, phosphoric acid and potash are being imported from overseas, usually granulated or pelleted. This is preliminary to their manufacture shortly in New South Wales. One such mixture marketed here this year contains 16 per cent nitrogen and 20 per cent phosphoric acid. It has been sold to farmers in many areas, to a total of 1,060 tons.

Strategic dressings of pastures and fodder crops with nitrogenous fertilizers when quick feed is specially required is increasing. It is becoming standard practice for progressive farmers in coastal districts and under irrigation. Calcium ammonium nitrate and anhydrous ammonia are popular for this purpose.

Nitrogenous fertilizers applied to wheat have given some spectacular and some disappointing results.

In the north-west some recent investigations have shown that superphosphate will increase wheat yields on certain soil types. In the past it was accepted that fertilizer was unwarranted, but on the past year's results a notable change has taken place. There have been yield increases from 31.6 bushels (no fertilizer) to 51.5 bushels (with fertilizer) and from 34.8 bushels to 53.3 bushels. Consequently, fertilizer sales have greatly increased in the north-west.

Soil analyses as a basis of fertilizer recommendations are being done in New South Wales by a number of commercial firms. More research is required before farmers should accept the recommendations with confidence.

Commercial fertilizer interests have also this year sown an extensive series of wheat fertilizer trials, using a soil analysis technique based on some C.S.I.R.O. work.

Introduction of the new 44.6 per cent sulphur fortified superphosphate has been followed by a trend away from use of gypsum as a sulphur source.

Fodder Conservation Trends

Fodder reserves have appreciably increased in a run of favourable seasons.

There has been little drought-feeding need, but on the other hand supplementary feeding to meet seasonal fluctuations is increasing.

In 1950-51, wheaten, oaten, lucerne and pasture hay reserves in New South Wales amounted to 680,416 tons, and silage to 87,253 tons. By 1961-62 reserves of hay had increased to 1,775,977 tons, and silage to 567,801 tons. The figures reveal an increase of 260 per cent in hay reserves and of 650 per cent in silage reserves in that decade.

Since then, cereal hay production has remained static but there has been a spectacular increase of pasture and lucerne hay. Pasture hay shows a tenfold increase and lucerne hay a fourfold increase. Grain reserves on farms are also at a high level. Even so, the known fodder reserves today fall far short of requirements to meet a dry period comparable even to 1957, a year which could not be regarded as a major drought.



Grain Sorghum Bulk-harvest

Interest in grain sorghum has been stimulated by availability of hybrids. Demand for hybrid seed has exceeded supply. Widespread trials have shown that hybrids yield 25-30 per cent higher than open-pollinated varieties.

Because of the dry period in the 1962 spring, the past season was not favourable for making pasture hay, and rain at harvest damaged cereal hay. As an offset, oat grain production was good and conditions in the summer were generally favourable for lucerne hay making. In coastal areas floods seriously damaged maize crops, and the grain has been used largely for supplementary feeding of dairy stock.

Increasing interest in silage is the trend in fodder conservation. It is not a spectacular trend, but notable. Mechanisation is playing an increasingly important role.

Interest is also apparent in artificial drying of hay, but present indications are that the costs are too high except for special cases.

Lot-feeding of cattle, based on the American experience and dependent on conserved fodder, has not advanced. This is due in part to there being no rewarding market for the special, costly type of beef produced.

Manufacture of processed stock foods is increasing, mainly to meet the needs of poultry, dairy and stud stock owners. It has created a good market in particular for grain sorghum and for barley rejected by maltsters.

Irrigation

Developments.—Despite above average rainfalls in the past year, there was constant demand for information on irrigation. It was notable in the north-west and central west where river regulation is going ahead as a result of Keepit Dam on the Namoi River, the building of Burrendong on the Macquarie, and commencement of enlargement and reconstruction of Wyangala Dam on the Lachlan. There was also sustained interest in the far west, through the possibility of inauguration of irrigation schemes in the vicinity of Menindee on the Darling River.

Although seasonal conditions have been against irrigation use, numerous additional private projects have been established. These have been mainly spray-irrigation, but some large flood-irrigation projects by pumping are being established on inland rivers. This is on the Namoi in particular, for cotton growing, and at Mathoura near Deniliquin in the south-west.

In the coastal regions, copious rain resulted in little use of irrigation plants. The emphasis has been rather more vigorously on thoughts of flood mitigation and drainage.

Fifty-four new farms in the developing Coleambally Irrigation Area were made available by the W.C. & I.C. for settlement. The Department of Agriculture has assisted the Commission in this work, in subdivision and design of the farms, and provided the extension advice for farmers on development and production from their new farms.

Irrigation Schools.—Three schools dealing with irrigation were organised. One of these was a school for personnel of firms connected with the irrigation industry. It was a three days' school at Hawkesbury Agricultural College, in association with the Society of Agricultural Engineers. Forty members enrolled for the full course, and some sessions were attended by over 100 persons.

A well-attended irrigation school for farmers was organised by the South-Western Region.

An advanced irrigation school for Departmental officers, the second of its type, was held at Yanco Agricultural Research Station. Ten officers from other States also attended; five from Victoria, three from South Australia and two from Queensland. This completed a programmed series of in-service training schools on irrigation. The series was spread over four years, and nine schools were organised. Over 250 extension officers received the training, to assist their discharge of extension duties.

Irrigation and Allied Committees.—The Special Agronomist (Irrigation) represented the Department in a number of committees, as follows, the primary department shown in brackets: Blowering Dam Investigations Committee (Water Conservation and Irrigation Commission); Assessment Board—Hunter Valley Flood Mitigation Act (Department of Conservation); Development of Irrigation Districts (Water Conservation and Irrigation Commission).

The Chief, Division of Plant Industry, represented the Department in the committees appointed to consider irrigation development at Lake Tandou (Water Conservation and Irrigation Commission), irrigation development in the vicinity of Menindee (Department of Industrial Development and Decentralisation), and salting of Tullakool Irrigation Area (Water Conservation and Irrigation Commission).

Meetings of the following inter-departmental committees were also attended: Hunter Valley Conservation Trust (Department of Conservation); Water Research Foundation; and the Standards Association of Australia—Spray Irrigation Drafting Sub-committee. They totalled near to 40 meetings.

Farm Water Supplies Act, 1946.—The Water Conservation and Irrigation Commission administers this Act, but individual applications for advances by farmers in excess of £1,000 are referred to this Department for examination and report as to the economics and improved production potential of the project. During the year 57 new applications were dealt with, and 24 others that were current at the start of the year were finalised.

Agronomic advice, where sought by the Commission, was tendered also on a number of cases that were either below £1,000 in value, or did not involve an advance.

Irrigation Handbooks.—These books, comprising selected lectures and papers given at the in-service training schools, have been sought by other States, the C.S.I.R.O., and people from India, New Zealand and U.S.A.

The "practitioner" book has been supplied in quantity sufficient to meet three years' needs as an irrigation text book at Hawkesbury and Wagga Agricultural Colleges and at Yanco Research Station in the Farm Certificate Course.

Pastures

PASTURE RESEARCH

Pasture Species Improvement

New pasture species continued to expand the prospects for pasture improvement.

Summer Legumes.—The promising range of summer legumes included *Glycine javanica*, *Lotononis bainesii*, "Siratro" (bred by C.S.I.R.O., Brisbane), *Desmodium uncinatum*, and "Rongai" *Dolichos lab lab*. A variety of *Glycine javanica* named "Clarence" was released by the Department this year.

In trials on the Manning River promising results have been obtained with *Glycine javanica*, *Desmodium uncinatum*, *Siratro*, *Lotononis bainesii* and *Setaria sphacelata*. All except *Lotononis bainesii* have passed the "small plot" stage and are now being tested on half acre areas where they can be grazed. *Setaria* has been sown in combination with the three first-mentioned legumes.

These new summer legumes are being used to build a better, "year-round" feed source for dairy and beef production on the north coast.

Dryland Cocksfoots.—Dryland cocksfoots such as Currie and Brignoles offered promise of meeting needs for a perennial grass to utilize soil fertility build-up and to exclude weed growth following annual Subterranean clover pastures.

Creeping-root Lucernes.—These, developed by the C.S.I.R.O. for adaptability to the Australian environment, were tested by this Department in conjunction with the C.S.I.R.O.

In trials at Inverell, Hairy Peruvian lucerne has proved superior to other lucerne strains. Its winter production is above that of Hunter River and summer production of the two are equal.

A seed increase area of the reputedly Coumarin-free "Cumino" strain of *Melilotus alba* was established in spring, 1962.

Summer-growing Grasses.—Buffel grasses, and *Sorghum alnum*, and *Setaria sphacelata* continued to give useful results in northern parts of the State.

Kangaroo Valley Ryegrass.—This is now produced under Departmental certification. Its sales amounted to 7,000 bushels in 1962-63, a tribute to heat tolerance and persistency evolved under natural selection in its Australian environment.

Pasture Species Adaptability Trials.—A series of these trials was conducted under the U.P.S.E.T. scheme, to extend knowledge of pasture strains and to determine their suitability for various parts of the State.

Exchanges of Subtropical Pasture Species.—Material was exchanged with the C.S.I.R.O., at Brisbane and Canberra, and with overseas countries.

Winter Legumes.—The best of these so far tested on the Manning River have been Ladino white clover, red clover and Clare subterranean clover. In wet situations *Lotus uliginosus* and strawberry clover have been most useful.

Plant Nutrition and Fertilizer Use

Rapid increase of sown pasture acreage on formerly unfertilized native pasture lands has called for research into the fertilizer needs during establishment and maintenance stages. The Uniform Pasture Survey and Extension Trial series has revealed a lot of useful data on nutritional deficiencies, throughout the State. In addition, detailed research was undertaken on phosphorus x sulphur ratios, superphosphate rates for establishment and maintenance of pastures, and legume nodulation requirements on "acid" soils.

Major and trace element deficiencies received pot trial study in the plant nutrition glasshouse at Hawkesbury Agricultural College, and in field trials.

Widespread nitrogen deficiencies, and increasing availability of nitrogen fertilizers at lower prices, are currently inviting greater use of nitrogen on pastures and forage crops. Problems in nitrogen fertilizer have been studied at Berry, Wollongbar and Leeton.

At Tia (Walcha) the topdressing research on pasture plots was discontinued this year. The main goal now is to examine the residual values of fertilizer treatments applied in the past nine years. A paper on phosphorus x sulphur ratios during pasture establishment and maintenance has been prepared, and another on the effects of size-grades on brimstone sulphur availability.

Initial versus annual maintenance rates of superphosphate, and the value of gypsum as whole or in-part replacement for superphosphate at various stages in the fertilizer programme, were studied in the Tia experiments this year. This was in association with officers of the Chemistry Branch, Division of Science Services.

At Graman, following observed response to molybdenum, zinc, boron and sulphur, with burr medic as the indicator plant, further trials have been sown with this species. In a small grazing trial sulphur application had a marked effect on pasture composition. The sulphur-treated area had a higher carrying capacity and retained a good mixture of the original lucerne and *Phalaris*. The "no-sulphur" area lost virtually all its lucerne.

In the Taree District, the failure of lucerne to persist is being examined, so far mostly from the nutrition angle. Responses to superphosphate, molybdenum and lime have been obtained, but other factors are involved. White-fringed weevil has been shown to kill large numbers of newly established plants and nematodes are also suspected of helping to thin the stands. These additional aspects are now being looked at, especially the white-fringed weevil.

A recently commenced trial at Taree aims to determine the necessary phosphate maintenance dressings, using superphosphate and rock phosphate and combinations of them. This is a long-term trial.

Also at Taree, results of a trial have been good in an upland area where carpet grass was renovated and 3 cwt. of superphosphate plus $\frac{1}{2}$ ton of lime per acre were applied. Vigorous white clover growth followed this treatment, and *paspalum* has also appeared.

Pasture Establishment Work

Pasture establishment research has occupied a good deal of attention in keeping with the rapid development phase of pasture improvement in New South Wales, but there is still much to be done in this field.

The clover establishment trial in the U.P.S.E.T. series has been redesigned to investigate pasture establishment on "problem" acid soils.

Pasture Management and Utilization

Increased emphasis has been placed upon problems of pasture management and utilization, in keeping with the need for more facts about pasture utilization and overall "feed-year" management. The inherently higher carrying capacity of sown pastures, and at the same time their higher capital and upkeep costs underline the need.

New projects in this area of pasture-livestock production research include those planned on a joint, inter-Divisional basis for implementation at Shannon Vale Nutrition Station and Glen Innes Agricultural Research Station. At Shannon Vale, wool production is being studied at various stocking rates and on pastures receiving various superphosphate levels.

At Glen Innes a beef production trial conducted on a "farmlet" basis has been started, to compare the production potential of improved pastures and improved pastures supplemented by forage crops and fodders.

These new grazing trial—"feed-year"—pasture utilization projects were made possible by grants from the Wool Research and the Cattle and Beef Research funds.

A further beef "feed-year" research project was started at Grafton this year, also supported by finance from the Australian Cattle and Beef Research Committee.

At Leeton Station, rate-of-stocking trials with both cattle and sheep were continued this year on irrigated pastures. The main problems are seasonal feed shortages in late summer and late winter months, coupled with unsatisfactory rates of beef and lamb "gains" on irrigated pastures. Production curve studies at Leeton with pasture species, pasture mixtures, and complementary winter and summer forages, have given excellent pointers towards an improved seasonal feed situation to meet the livestock-feeding problems mentioned above.

At Wollongbar Station, valuable long-term research programmes in the interest of the far north coast dairy industry continued. An interesting new research project was initiated in three selected "whole-farm" units, to test the technical practicability and economic outcome of the application of "feed-year" research results to actual farm practice. This project has been financed in part by the Rural Credits Development Fund of the Reserve Bank and is in co-operation with Division of Marketing and Agricultural Economics.

Pasture Experiments, U.P.S.E.T. Series.—The design and detail of U.P.S.E.T. trials were completely reviewed and modified to provide a more complete service in surveying and demonstrating species adaptability, pasture establishment techniques, soil deficiencies, and fertilizer requirements.

Pre-packaging of pasture trial kits was resumed in the spring of 1962 and autumn of 1963. It had been suspended for the previous 12 months. A total of 435 kits was prepared in 1962-63. The total of kits supplied from January, 1959, to June, 1963, is now 1,502.

Six fertilizer trials, one "clover establishment on problem soils" trial, and eleven trials with various groups of new and old pasture species and strains are now included in the U.P.S.E.T. series.

With the assistance of the Biometrician, and the Chemistry and Biology Branches of Division of Science Services, good progress has been made in collating the results of earlier trials for publication.

Pasture Research Finance from Banks, Commercial Companies and Rural Research Councils

The Department has had valued assistance and support for the Hunter Valley pasture research programme from the Hunter Valley Co-operative Dairy Company, Sulphide Corporation Ltd. and Australian Fertilizers Ltd. At Taree, the Manning District Agricultural Research Council and Australian Fertilizers Ltd have co-operated with the Department in the continued programme of pasture and "feed-year" research. This year projects with a potential for economic analysis were initiated on a "whole-farm" basis in the Taree area.

At Wollongbar the three "whole-farm" research farm projects mentioned in an earlier paragraph are supported in part by finance from the Rural Credits Development Fund of the Reserve Bank.

Research Personnel Standards

Two Divisional officers have recently taken Ph.D. degrees at overseas Universities, four have completed M.Sc. degrees, and nine research officers are currently registered at the Universities of Sydney, New South Wales or Queensland for Master's Degree research projects.

Research agronomists have been encouraged to register with Universities for M.Sc. and other higher degree studies where such would fit them better to carry out a good standard of research in the best interest of the Department and with attendant advantages in research morale.

Pasture Research Equipment for Regional Offices

Five (5) "Johnson" Flail Quadrat Harvesters were made and supplied to five Regional Headquarters for use by agronomists for harvesting pasture experiments.

PASTURE SEED PRODUCTION

Organisation Trends.—This Department was represented at an Australian Conference in Melbourne on Seed Certification and Registration problems. A Commonwealth Committee was set up to consider the possibility of greater merchant and grower participation in Seed Certification Schemes, as a means of relieving State Departments of Agriculture of certain aspects of certification which could be done by non-governmental persons and organisations.

A further far-reaching development, approved by the Australian Standing Committee on Agriculture and initiated in this State by this Department, was the formation of a N.S.W. Herbage Plant Liaison Committee. This was formed in May, 1963. It is to concern itself with the orderly testing, seed increase, and naming and release of new cultivars of pasture plants and forage crops. The C.S.I.R.O. (Canberra and Brisbane), the Universities, the N.S.W. Soil Conservation Service and this Department are represented in it.

Seed Certification was this year done for seed produced in the Australian Capital Territory.

PASTURE SEED CERTIFICATION

The Range.—Pasture seeds certified included subterranean clover, white clover, Barrel Medic 173, perennial ryegrass, and *Phalaris tuberosa*.

Increased Tonnage.—This season was generally more favourable for seed production than the previous year. Total tonnage finally certified increased by 95.5 per cent in comparison with 1961-62, from 766 tons to 1,569 tons.

Compared with 1961-62, the number of areas registered increased by 12.7 per cent; acreage registered increased by 21.7 per cent; and areas passed at paddock inspection increased 34.8 per cent.

Revenue collected in fees for registration, inspection and against increased by 43.5 per cent from £5,100 to £7,200.

Subterranean Clover.—This accounted for 69 per cent of the total pasture seed certified. Of the 1,362 tons of subterranean clover certified, 75 per cent was Mount Barker, 18 per cent Dwalganup, 3.5 per cent Tallarook, with smaller amounts of Marrar, Bacchus Marsh, Clare, Yarloop, and Geraldton strains.

***Phalaris tuberosa*.**—Seed production was only 100 tons, as against 140 and 120 tons certified in the previous two seasons.

Kangaroo Valley Ryegrass.—Seed production increased from 27 tons to 65 tons. All met ready sale at very satisfactory prices.

N.S.W. Perennial Ryegrass.—A total of 40 tons was certified.

Barrel Medic 173.—This increased to five tons.

White Clover.—The area registrations showed a very big increase, to 3,003 acres. However, widespread incidence of the clover case moth (*Coleophora spissicornis*) greatly reduced the potential. The seed crop at harvest was only three tons. Control of this pest of clover seed crops is to be investigated by the Entomology Branch in the coming season.

Uncertifieds.—Uncertified lucerne, *Paspalum dilatatum* and subterranean clover seed totalled several hundred tons. There were smaller but appreciable totals of Wimmera, Italian, H1 and Perennial ryegrasses, and some *Phalaris*, prairie grass, cocksfoot, carpet grass, white clover, and red clover. The uncertified tonnages added considerably to cash returns in the pasture seed industry.

There has been considerable interest in building up supplies of seed of the species and strains which have been promising in recent trials, including *Glycine javanica*, *Desmodium uncinatum*, Siratro, Lotononis and Dolichos on the north coast, *Lotus uliginosus* and *Lotus hispidus* on the south coast, also Currie and Brignoles cocksfoot and *Demeter fescue* on the southern and central tablelands and slopes. There has been a consistent demand for the Department to undertake certification of several of these lines, particularly *Glycine* and the Mediterranean strains of cocksfoot.

Articles and a Film on Seed Production.—A number of articles have been written by the Seed Production Agronomist, on the agronomy and seed production of lucerne, red clover, crimson clover, and *Lotus major*. A publication called *Management of Pastures for Seed Production* has been well-received by seed growers and the seed trade. In fact it has been necessary to order a 2nd edition.

The Seed Production Agronomist and the Seeds Officer supplied background technical information for the script prepared by Division of Information Services for a 16 mm. cine film on production of pure seed, together with advice on location and timing of sequences to be filmed. By arrangement with Department of Primary Industry the Commonwealth Film Unit is making the film for use in extension service.

The film refers to all the types of seed certified in this State, and step by step goes through the production of certified subterranean clover seed to show the controls exercised by the Department of Agriculture to ensure good quality true-to-type seed for local and export use. A section on seed testing is also in it. The film will be available for use during 1963-64.

Export of Pasture Seed.—This is growing in importance. This year 100 tons of *Phalaris tuberosa* and 50 tons of subterranean clover seed were exported to South America, 100 tons of subterranean clover to New Zealand, and 10 tons of Rhodes grass to Israel. *Paspalum* seed export to U.S.A. amounted to 50 tons, and 30 tons of carpet grass was sold to America and South-east Asia. Half a ton of Kangaroo Valley ryegrass was exported to U.S.A. for trial purposes.

Local seed merchants are actively exploring the possibilities of expanding sales in these and other overseas markets.

Inspections under Various Acts.—The Inspectors (under various Acts) visited 136 towns and inspected stocks of seeds, stock foods and medicines, fertilizers and pest destroyers in 417 stores during routine inspections. They took twenty samples under the Agricultural Seeds Act and, under the relevant Acts, nineteen stock foods, two stock medicines and ten pest destroyers. Some unregistered products were noted and appropriate action was taken in each case. In only two cases are prosecutions pending. Retailers and wholesale distributors have been co-operative with the inspectors. Breaches of the Acts were in some cases followed back to the manufacturers or prime distributors of the faulty or unregistered lines, to remedy the matter quickly at its source. Co-operation of the firms concerned has invariably been good.

SEED TESTING LABORATORY

The Seed Testing Laboratory tested as in previous years about 2 500 samples and supplied a wide range of information on seeds and seed testing to various authorities, seed firms and growers.

The Seeds Officer continued in the Editorial Committee of the *Australian Seed Testing Newsletter*, also as the State member of the International Seed Testing Association (I.S.T.A.) and in the I.S.T.A. Purity Committee. The Seed Testing Laboratory again participated in I.S.T.A. "referee" testing on a world-wide basis.

The Seeds Officer also provided a further course of lectures on Seed Testing for the Sydney Technical College. This course helps commercial seed analysts.

Weeds

CO-OPERATION WITH OTHER ORGANISATIONS

With other Departments, and Local Government.—Close liaison was maintained with Department of Local Government in administration of noxious plant legislation. Department of Local Government made £80,000 available to local Councils for weed control. This was dispersed as follows: to eight counties, £39,950; to seventy-one shires, £36,900; to twenty municipalities, £3,150.

These grants helped special efforts to co-ordinate control of serrated tussock, St. John's Wort, noogoora burr, skeleton weed and groundsel bush. Some councils responded well. The disinterest of others in respect of noxious plant control has caused serious concern.

A number of changes in the declarations of noxious plants have been recommended to the Department of Local Government.

Weed problems were discussed with representatives of such organisations as the Electricity Commission of N.S.W., the Health, Railways and Public Works Departments, the Forestry Commission and the Postmaster-General's Department.

Meetings were held with Victorian and South Australian authorities regarding border problems of noxious plant control.

A two-days' school on serrated tussock control, for council weed officers and others concerned with the dissemination of information on weed control, was held at Queanbeyan. Personnel in the South Coast and Tablelands Agricultural Region attended.

With Herbicide Manufacturers.—Liaison was maintained with herbicide manufacturers and importers, in research, advisory work and marketing problems. The weeds research officer appointed by Geigy Australasia Pty. Ltd. and located at Hawkesbury Agricultural College is carrying out a co-operative research programme. The arrangement is working well.

WEEDS RESEARCH

Serrated Tussock

Aerial Techniques.—Work continued on control of serrated tussock on non-arable land by aerial application of herbicides, fertilizers and pasture species. A further 175 acres was sprayed in January, 1963.

Application of 25 lb. of 2,2-DPA per acre in March, 1962, resulted in 80 to 90 per cent kills of tussock. The most serious limiting factor was aerial application. Most successful results came from spraying as soon after dawn as possible, whilst wind and evaporation were at a minimum. Normal aerial equipment for crop or pesticide spraying at low rates of liquid per acre appears unsuitable for serrated tussock spraying in rugged country.

Improved species establishment, sown from the air amongst chemically treated tussock, proved highly successful, even though the aerial placement of superphosphate and pasture seed was not accurate enough to cover all of the sprayed area. Techniques to eliminate these "strip effects" are under investigation.

Seven landholders this year employed aerial spraying, on 225 acres, under the guidance of the Department. These farmers appreciated that the method is in its infancy, but were prepared to try it.

Time-of-Oversowing Trials.—Late autumn and early winter again appeared the most reliable times to sow pasture seed from the air on non-arable land in the central tablelands.

Herbicides.—New herbicides, with Paraquat and Basinex as registered trade names, showed promise for killing serrated tussock; 2,2-DPA is still the standard one.

Time and Rate-of-Application Herbicide Trial.—Unburnt serrated tussock was killed by 10 lb. of 2,2-DPA per acre under the warm, dry conditions which prevailed in November, 1962. However, kills with rates as low as that appear to occur only under ideal climatic conditions.

Variable Crude Protein Content of Serrated Tussock.—Crude protein content of adult tussock foliage has been found to vary from 4.75 per cent in spring and summer to 3.25 per cent in winter. Crude fibre varied from 31.5 to 35 per cent. Crude protein content of new foliage produced in the three months after burning varied from 6 per cent in spring to 12 per cent in autumn. The crude protein content of new foliage produced in the month after burning varied from 15 per cent in September to 10 per cent in November.

Spot Spraying.—The practice of "spot spraying" serrated tussock, as tested and recommended by the Department was more widely adopted in the summer of 1962-63. Landholders applied over 8,000 lb. of 2,2-DPA, as against only 500 lb. in the previous summer.

New Zealand Study Visit.—A four-weeks' study visit to New Zealand was made by the serrated tussock research agronomist in July, 1962, in association with attendance at the 16th New Zealand Weeds Conference. He included visits to the major serrated tussock areas in New Zealand. An article published in February, 1963, issue of *The Agricultural Gazette of N.S.W.* reported on this visit, but some significant points are included here:—

The major conclusions gained from this trip were:—

- (1) Helped by large amounts of money, New Zealand is successfully eradicating serrated tussock. There were 20,000 acres of dense tussock ten years ago, but there are now only 2,500 acres. This area will be treated in 1964.
- (2) New Zealand is using chemicals and pasture species to kill and replace the tussock. Much of the treatment is from the air.

- (3) Tussock regeneration has to be closely watched. Where tussock is seemingly eradicated and a pasture has been established and grazed heavily, tussock regenerates from seed in the soil. The new tussocks are removed by concentrated chipping. In the case of a reclaimed property at Blenheim tussock seedlings are still regenerating after ten years. About 5,000 man-hours are spent per year in chipping the 2,000-acre property. No appreciable fall in the number of hours' chipping per year has occurred.

A process has been found by which one-year-old seedling tussocks are disposed of chemically by about 2 lb. 2,2-DPA per acre. (This process is currently under trial in Australia.)

- (4) Afforestation has not been much used in New Zealand for tussock control, but, in one case, tussock seed was viable after thirteen years in the soil under pine trees.

Herbicides Research

The herbicides research programme at Hawkesbury Agricultural College has been markedly reduced by loss of staff, but trials in many vegetable and other crops have yielded valuable results.

Weeds in Potatoes.—Diuron, simazine, atrazine, and prometryne all gave very promising results when applied pre-emergence on four varieties of potatoes; DPA was effective as a post-emergence treatment.

Weeds in French Beans.—Pre-emergence treatments with dacthal, ametryne, prometryne and 2,4-dichlorophenyl, 4-nitro phenyl ether, all gave promising results.

Weeds in Carrots.—Best results with pre-emergence herbicides were obtained with propazine, prometryne and amiben.

Weeds in Flower Crops.—Several trials were carried out in crops for the "cut flowers" trade, notably in gladiolus and daffodils, each of which is grown extensively for the trade. In each, very satisfactory weed control without damage to the flowers was obtained with simazine and atrazine, each at 2 lb. active ingredient per acre, and with monuron and diuron each at 2½ lb. active ingredient per acre.

One instance of damage to gladioli reported to have followed commercial spraying with pre-emergence herbicides was found to be due to excessive application rates. Approximately eight times the recommended rate was applied.

Cineraria and corn flowers were used as indicator plants to test the possible use of CDEC. Both species tolerated quite high rates of CDEC, up to 18 lb. per acre, applied after transplanting and watering.

Weeds in Field Crops.—The main field crops in which tests were made were summer cereals. Atrazine was one of the best of the herbicides tested in maize, sweet sorghum, broom millet and grain sorghum and, under the spray irrigation conditions, was effective both as pre-emergence and early post-emergence sprays. Propazine was also very satisfactory on sweet sorghum.

Persistence of Herbicides in Soil.—To investigate the persistence of various herbicides in the soil, a number of bio-assay trials were carried out in the glasshouse. These were to determine the rate of break-down of each chemical in the top-soil, the effectiveness of the chemical as a herbicide for various periods after application, and the penetration of the chemical into the sub-soil. Soils to which herbicides had been applied in the past were collected from throughout the State for this work, and other soil samples were taken from College field trials especially for these investigations.

SPECIFIC WEED PROBLEMS

New Weeds

Unfortunately, whilst a number of major noxious weed pests continued to spread, several new ones have been identified or recognised for the first time.

Mesquite (Prosopis juliflora).—Of particular concern has been the discovery of mesquite. It is in gardens and along water courses in far western districts, at least at a dozen places. This spiny shrub is a serious problem in the southern U.S.A., whence it originated, and in north-western Western Australia where first it was planted as a fodder shrub.

Alligator weed (*Alternanthera phytoloxeroides*).—This has been identified from two sites near Newcastle. This weed is a serious pest along waterways in parts of the Americas.

Pascalia weed (*Wedelia glauca*).—This also has been positively identified near Newcastle. It is a perennial sunflower-like plant, and reported as one of the most serious weeds of cultivation in the Argentine.

The Earlier Established Weeds

Water Hyacinth (*Eichhornia crassipes*).—Serious infestations in the Murray district have been reported. It is one of the few areas in inland New South Wales where the plant occurs. It has not been possible to arrange effective action for its control.

Serrated tussock (*Nasella trichotoma*).—The principle developments have been discussed under "Weeds Research". However, it is important to record that infestations have been confirmed for the first time in Molong and Waugoola shires. The Molong incidence is the most westerly record of this weed in the State. Inspections have shown also that there are more infestations in Canobolas Shire than was previously thought to be so.

Groundsel bush (*Baccharis halimifolia*).—It exhibits an upsurge after each spring when rainfall has been favourable. Such a spring occurred in 1962. Therefore the spread has again been most noticeable. The plant will grow almost anywhere, from the tops of the mountains to swampy conditions and tolerates all soil types.

Many of the seeding areas are comparatively inaccessible; for examples:—such places as along the border fence which follows the McPherson Range and in swampy areas such as those, comparatively heavily timbered with Ti-tree, surrounding the Cobaki broadwater and Cudgen Lake. The weed is now found on almost all abandoned banana plantations and very few properties which comprise rough country in that district are free of it.

Some recent attempts to control groundsel bush have been ineffective because of treatment at the wrong time of the year. However, through the allocation of increased funds specifically for its control, and with closer liaison between the Far North Coast County Council and District officers of the Department of Agriculture, improvement is now noted.

Wheat

Wheat Production a Record.—Of the estimated 5,049,000 acres sown to wheat in 1962 for all purposes (about 4,800,000 acres for grain), 28 per cent was in the Northern Division, 32 per cent in the Central Division, and 40 per cent in the Southern Division. Some 31 per cent of the New South Wales wheat delivered to the Australian Wheat Board was from the north.

Receivals of the 1962-63 wheat by the Australian Wheat Board in N.S.W. totalled a record 98,194,000 bushels (91,907,136 bushels in bulk and 6,286,864 bushels in bags), compared with the previous year's 67,600,000 bushels. Adding to this receival figure the approximate 3,500,000 bushels of N.S.W. grain delivered through the Victorian Railway System and about 9,000,000 bushels retained on farms for seed and feed, the record 1962-63 N.S.W. wheat harvest totalled about 110,000,000 bushels; about 15,000,000 better than the previous record (1947-48), and almost 33,000,000 bushels better than in 1961-62.

If this estimated production is confirmed by statistics, 1962-63 yield per acre was a record at 22.9 bushels per acre.

Because of late harvest rains some 4,500,000 bushels of off-grade wheat was delivered, mostly from Southern and Western districts. This quantity was small by comparison with the previous year, when over 25 per cent of the 67,600,000 bushels delivered was classed as off-grade.

Premium Wheats.—Local mills paid a premium averaging 12.92 pence per bushel on 3,296,194 bushels of 1962-63 crop wheat, compared with 24.38d. per bushel on 3,441,036 bushels in the previous year. Of the total local premium purchases, the greatest quantity was of hard varieties, 2,618,243 bushels averaging a premium of 15.1 pence per bushel, compared with 677,951 bushels of soft varieties averaging 4.47 pence per bushel.

Highest individual premium paid, 49 pence per bushel, was for a parcel of the Departmentally produced macaroni wheat Dural. The varieties Mengavi, Koda, Spica, Gabo, and Gamenya accounted for almost 88 per cent of the hard variety deliveries for which local premiums were paid.

In addition to the 3,296,194 bushels for which local mills paid a premium, a further 8,000,000 bushels of varieties with a high protein content were received into bulk installations for eventual sale to local and/or overseas buyers.

The north produced almost 90 per cent of the wheat received at a premium or subject to assessment of premiums. An interesting development was the bulk receipt from certain parts of the south, particularly irrigated areas, of soft biscuit wheat on a premium basis and subject to protein test upon delivery. However, premiums paid for individual parcels were small in comparison with those for north western bread wheat.

F.A.Q. Standards.—Again two F.A.Q. standards were declared. One was for northern F.A.Q. wheat, which comprised 30 per cent of F.A.Q. receivals, at 64½ lb. per bushel Schopper weight; compared with 63½ lb. the previous year. The other was for the southern and western wheat combined, 70 per cent of F.A.Q. receivals, at 63½ lb. per bushel; compared with 61 lb. the previous year. No separate standard was set for either off-grade or bagged wheat. The protein percentages of the F.A.Q., northern 11.2 per cent and south-western 10.5 per cent, were appreciably less than for the previous year's wheat.

Variety Popularities.—Latest available wheat variety statistics are for the 1960-61 season. The most-grown varieties were, in order—Glenwari, Bencubbin, Gabo, Festival, Koda, Sabre, and Olympic. It is known, however, that in 1962 wheagrowers sowed greatly increased acreages of Heron, Mengavi, Falcon and Gamenya. Less Gabo and Glenwari and possibly less Bencubbin were sown in 1962.

Wheat Variety Recommendations.—A major reorganisation was made, of areas covered by wheat variety recommendations. Under the new plan, varieties are recommended for the six Agricultural Regions mainly within the wheatbelt, and for irrigated areas. The new scheme began with the 1963 sowing season. It will benefit wheat growers.

Using Agricultural Region organisational resources the scheme provides for more effective use of field and quality trials, sounder recommendations, and more efficient extension of advice associated with variety recommendations. Also it will allow accurate assessments of the extent of farmer adoption of variety recommendations. The official variety statistics are on a Shire basis and each Agricultural Region is an aggregate of Shires.

For 1963 sowings the well-known Gabo was removed from recommendations. In its place the new varieties Gamenya and Mengavi were recommended for growing over a wide area in the north and in irrigated areas. The new variety Falcon was included in recommendations in the western wheatbelt.

Winter Wheats.—Grower interest in this new type of wheat continued to increase. When variety statistics are available, later this year, expanded acreages of the Departmentally bred Wingen and Windebri will show up. Main interest was in the north-west and under irrigation, for grazing after early sowing and to some extent for grain production following grazing. Further expansion will not be notable until the breeding programme evolves new varieties combining higher grain yield with rust resistance.

Wingen grain won Commonwealth Championship honours in the open wheat classes at the 1963 Sydney Royal Show. Premium sales of winter wheat from the 1962 harvest included 27,000 bushels of Windebri, at an average of 12.5 pence premium per bushel. Some individual parcels realised a premium of 28 pence per bushel.

Durum Wheats.—All grain of the Departmentally bred macaroni wheat variety Dural grown in the north-west in 1962 was either sold at a premium, for manufacture of high quality semolina, or retained as seed for 1963 sowing. Premium purchases of Dural approximated 90,000 bushels. These more than doubled the previous year's results. They averaged 32 pence per bushel. Highest individual premium bid was 49 pence per bushel.

In the last year for which wheat variety statistics are available, 1960-61, some 8,000 acres of Dural were sown in New South Wales. The area sown in 1963 was a little greater, but marked expansion of durum wheat acreage is unlikely until there is a better yielding rust resistant variety. At present, despite Dural's marked superiority in regard to semolina quality, the fact that the bread wheat Festival may normally be obtained for a lower premium and has some use in macaroni manufacture militates against large scale production of Dural.

Wheat Quality.—The N.S.W. Advisory Committee on Wheat Production and Marketing set up to investigate wheat quality problems as affecting production and marketing met frequently throughout the year. The Cereal Specialist, Division of Plant Industry, is a member and Secretary of this Committee.

In co-operation with the Chemistry Branch, Division of Science Services, useful information was obtained on the quality of new varieties under field test. Some 900 grain samples were secured from throughout the wheatbelt for milling and baking tests. In addition to the routine Departmental tests, uniform quality testing of a promising variety approaching release or recommendation was done by a number of collaborating laboratories.

Following uniform quality testing of the new varieties Gamenya, Mengavi, and Falcon by collaborating laboratories, the Standing Advisory Committee on Wheat agreed to recommend Gamenya and Mengavi for a wide area in northern N.S.W. and in irrigated areas in 1963. The Committee also agreed to recommend Falcon for growing in the western wheatbelt in 1963.

After the 1962 harvest, a promising northern rust resistant variety (Festival x Uruguay), bred by the Department, was uniform quality tested. If further tests after the 1963 harvest are satisfactory, release of this variety will be considered.

Entries in the open wheat classes at the 1963 Sydney Royal Show were well above those of recent years. The Departmentally bred winter wheat Winglen was awarded for the second successive year the Commonwealth Championship honours, judged for milling and baking quality and bench characters combined. Judged on bench characters alone Koda was best in the Strong bread wheat class. On bench characters the Departmentally bred Falcon was best in the Medium Strong bread wheat class, and the Departmentally bred Heron best in the Soft bread wheat and biscuit wheat classes.

In the hard blending wheat classes the only samples entered were of the Departmentally bred Festival. One of these scored higher points "on the bench" than any other wheat sample entered in this year's open wheat classes.

Wheat Variety Trials on Farmers' Properties.—Promising new wheat varieties were tested on farmers' properties throughout the wheatbelt in 1962. The trials gave useful information on field performance, yield, and baking quality of promising crossbreds and named varieties. In 1962 (1961 figures in brackets) randomised and replicated wheat variety trials were conducted with 61 (55) co-operative farmers, supervised by 21 District agronomists, testing 22 (29) wheat varieties.

In addition, detailed wheat variety trials were conducted on six wheatbelt Experiment Farms and Stations. The results, and those from all variety trials conducted by the Wagga Agricultural Research Institute, helped the preparation of detailed wheat variety recommendations throughout the State.

Wheat Variety Performances.—New varieties tested were Gamenya, Mengavi, Kenora, Hopps, Moora, Gala and Falcon.

Gamenya, a backcross derivative from Gabo, was again the outstanding early maturing variety in the north. Mengavi, the other Gabo backcross, was inferior to Gamenya but was equal to Gabo. Stem rust did not have an important influence on yields, but in many instances new strains of stem rust which can attack Gamenya and Mengavi were found.

Two winter wheats Winglen and Windebri were tested in several trials. Windebri continued to produce the higher grain yields. In central and southern areas the winter wheats generally did not compare favourably with spring varieties because of their late maturity.

The two new early maturing Queensland varieties, Kenora and Gala, proved inferior to both Gamenya and Mengavi. Also both these varieties were susceptible to new stem rust races. Kenora has been rejected from further trials because of its overall inferior yield and its overstable grain quality.

In the midseason to late maturing trials the main varieties of interest in the north were Moora and Hopps. Both varieties are resistant to the older strains of stem rust but are susceptible to some new strains. Hopps proved to be inferior to the recommended varieties Warigo and Eureka. Moora was equal to Eureka and superior to Warigo. A disadvantage of Moora is its consistently low bushel weight. Both Moora and Hopps have been rejected from further trials.

Falcon was tested in both early and late sown trials in central and southern areas. In early sown trials it proved inferior to Olympic but superior to Glenwari and all other varieties. In late sown trials it was inferior to Heron, about equal to Gamenya, and superior to all other varieties. Further milling and baking tests have confirmed its good quality.

Two new Victoria varieties were also tested in a few trials on Experiment Farms. These are Olympic A103, a selection from Olympic, and said to be a more even line, and Stockade. Stockade is a midseason variety of better quality than Olympic. Both varieties were equal or inferior to Olympic at four centres.

Two backcross strains of Heron with resistance to some of the prevalent strains of stem rust were tested at eight centres. They were about equal in yield to Heron.

Wheat Improvement Moves.—At the instigation of the State Wheat Improvement Committee the Departmental wheat and oat breeders, cereal specialist and cereal chemist, with representatives of the University of Sydney and officers of the Queensland Department of Agriculture and Stock, inspected north-western wheat areas and research centres early in October, 1962. This was to familiarise all with the problems associated with the different breeding programmes in N.S.W. The 10th Meeting of the State Wheat Improvement Committee was held in the country, at Gunnedah, during the tour.

Main discussions at that meeting concerned wheat breeding objectives and other matters related to wheat quality. Members of this Committee later met members of the N.S.W. Advisory Committee on Wheat Production and Marketing and, relative to wheat quality, presented their views on breeding, release, and recommendation of new varieties.

Soil Fertility and Rotation Experiment, Condobolin.—This experiment at Condobolin Experiment Farm has completed seven years. Further valuable information was gained this year. The experiment is now being reviewed, for possible modification in light of experience.

Wheat Fertilizer Experiments.—The State-wide series of Wheat Uniform Fertilizer Trials was discontinued after the 1961-62 harvest. The results for the complete three seasons are now being analysed. The information will be used in designing more precise trials in various districts.

Field Wheat Competitions.—Six Divisional Championships were conducted during 1962 by the R.A.S. The field judging of most of the local and all Championship competitions was done by officers of this Division. Approximately 740 crops were entered in seventy local competitions. Winning Championship crops were:—Northern Division, Gamenya (47 bushels per acre); Northern Slopes Division, Gamenya (54); Western Division, Mengavi (45); Central Slopes Division, Bordan (51); Riverina Division, Falcon (38); Southern Slopes Division, Falcon (54).

Departmentally-bred new variety Falcon performed in the southern half of the State the outstanding feat of fourteen local competition wins, and two firsts, two seconds and two thirds in the Championship Competitions.

Junior Farmers Wheat and Oat State Championships.—These were judged by the Wagga District agronomist. There were twenty-one wheat entries and two oat entries. The overall best wheat entry was a Gamenya at 52 bushels per acre, although the top yield wheat entry was a Mengavi at 62 bushels per acre. Cooba, the dual purpose oat recently released by the Department won the Oat Championship with 70 bushels per acre.

Oats

Oat Production.—Statistics are not yet available for the 1962-63 season but the 1962-63 grain crop is forecast as likely to be 14,500,000 bushels from a harvested area of 770,000 acres with a yield average of 18.8 bushels per acre. Hay production was forecast as 100,000 tons from 90,000 acres. Total oat sowings in 1962 for all purposes were estimated as 1,450,000 acres. More than usual of the total area, in fact about 47 per cent, was used for straight-out grazing, and, also, many crops grown primarily for grain were first used for early grazing.

The grain production estimated for 1962-63 would be well below the record 1958-59 season, when 1,627,000 acres were sown for all purposes. In that season 27,638,000 bushels of grain were harvested from 1,130,000 acres, and the yield average was 24.5 bushels per acre.

Oat Variety Popularities.—Latest available oat variety statistics are for 1961-62. They showed the popularity of some of the old stalwarts to be declining. Belar, most popular variety in the State for many years, had fallen from 52.8 per cent of the acreage in 1954-55, to 32.8 per cent of it in 1961-62. Algerian, grown for almost a hundred years, is still in second place; but had lost some popularity despite the improved latest Algerian strain. Fulmark and Avon have shown speedy rise in popularity. Other varieties on the increase are Orient and Ballidu.

Oat Variety Trials.—Detailed oat variety trials were carried out at nine Experiment Farms. Randomised, replicated variety trials on private farms were conducted in 1962 (1961 figures in brackets) with 37 (32) farmers supervised by twenty District agronomists and involving 20 (20) varieties.

Oat Variety Performances.—Yields were generally fair to good in variety trials. Some loss of yield and quality was due to the dry early October, the grain filling period. Late October rain was too late to improve most crops and had some adverse effect on straw strength and grain holding.

New varieties tested were Cooba, Kent, Klein 69B, V. R. Burke W4464, V. R. Bke. F. x WF W4587 and V. R. Boppy Belar W4606.

Avon remained the best of the named grain varieties and Cooba was the best grazing variety, in central and southern areas. Neither did so well in the north. Kent, an early maturer from Western Australia, showed no advantage over Ballidu and Orient and will be discontinued in trials. Klein 69B continued to produce good grazing yields on the coast and was highest producer of green fodder. It still has field tolerance to prevalent crown rust races. It gave good grazing and grain yields on the tablelands and northern slopes.

V. R. Burke W4464 maintained over a wide area its very high grain yielding. It also has a very strong straw, better than any other variety tested, but gives a low yield of fodder for grazing and its grain quality is inferior to most others. V. R. Bke.F x WF W4587 and V. R. Boppy Belar W4606 yielded well in northern areas. W4587 compared favourably with Belar, and W4606 compared with Algerian. The results of this year's trials will determine whether they are named and released.

Oat Variety Recommendations.—As with wheat, major re-organisation of areas occurred. Oat recommendations for 1963 sowings were based on the nine Agricultural Regions. The crown rust tolerant variety Klein 69B was added to recommendations for late grazing on the coast, and for grazing and grain in the eastern section of the Northern Agricultural Region. Dale was withdrawn from recommendations because of yield inferiority to Fulmark and Avon.

Oat Improvement Work in Northern N.S.W.—This work is done at Glen Innes Agricultural Research Station. The goal of the programme is release of disease and frost resistant varieties suitable for grazing, lenient and heavy, and grain.

Preliminary yield trials at Tamworth, Narrabri, Gunnedah, Grafton and Inverell tested the adaptability of newly fixed hybrids in different environments.

At Glen Innes the winter was mild and humid, and made difficult the selection of frost-hardy types. Therefore surplus material has been harvested, relatively unselected for winter hardiness. In a cold dry winter at Glen Innes, varieties with a low degree of frost resistance are severely damaged by frosts that occur immediately after grazing.

Two unnamed hybrids V. R. Bke.F x WF W4587 and V. R. Boppy Belar W4606 were included in farmers' experiment plot trials in 1962. W4587 is a midseason variety, with maturity about equal to that of Belar, while W4606 is a late maturing

variety with high grazing and grain yields. In early stages W4606 is quite prostrate and has a winter habit. Both varieties yielded quite well in northern trials and will be considered for naming and release early next year.

A moderately severe epidemic of stem rust in the late spring and early summer enabled notes to be taken on the variety collection and provided a selection index to segregate progeny of crosses that have one or more resistant varieties in their breeding. The variety Garry which has been used in breeding for rust resistance programmes for over ten years showed less resistance than formerly. Plants heavily infected with stem rust lodged badly at harvest time.

A crown rust epidemic at Grafton Experiment Farm yielded notes on the reactions of interesting varieties and on promising unnamed hybrids from the breeding programme.

Many lines were treated with smut inoculum before sowing so that selection could be made for this character. Quite a good infection resulted.

Seed and Fertilizer Rates Experiment on Grazing Oats.—This has been in progress for five years. Higher seeding rates and the application of sulphate of ammonia have significantly increase the yields. Superphosphate responses have varied according to the season.

Barley

Production.—Production statistics for the 1962-63 season are not yet available, but farmers' interest was greater and it is estimated that 1962 was another year of record acreage and production.

In 1961-62 the 201,000 acres sown for grain, in a total sowing of 226,000 acres, was the highest ever. Production of 4,137,000 bushels (malting 2,562,000; other 1,575,000) was 649,000 bushels less than the record production of 4,786,000 bushels in 1960-61.

To keep pace with farmers' interest in barley more variety trials were conducted with co-operating farmers during the year, and foundation seed barley was supplied to a greater number of growers for production of Registered Seed.

Barley Variety Trials.—Newer six-row and two-row barley varieties were comparison-tested with established varieties on farmers' properties in 1962. In 1962 (1961 figure in brackets) randomised and replicated barley variety trials were conducted with 20 (7) co-operating farmers, supervised by six District agronomists, and seven varieties were involved.

Barley Variety Performances.—Three six-row and four two-row varieties were tested in fourteen trials in 1962. Abyssinian had a higher overall yield than Ablyn. Beecher, recently introduced from Western Australia where it is the leading variety, was about equal to Abyssinian in yield. Of the two-row varieties, Research was the most successful; followed by Maltworthy, Noyep and Prior.

Cereal Rye

The latest available production statistics are for the 1961-62 season, when 26,244 bushels of grain were harvested from 2,276 acres out of a total of 8,126 acres sown for all purposes including green fodder. Because of the relatively low yield of cereal rye compared with other winter cereals, and uncertain prices for grain, there was less interest in the crop in 1962. The peak rye grain production was in 1939-40, when 194,890 bushels were harvested from 12,196 acres.

Basic seeds stocks of Weethalle, Strain 8, Black Winter and N.I.A.B. have been maintained.

Wheat, Oats, Barley, Rye Grazing Trials

At Cowra Experiment Farm the trial is comparing the grazing production of Winglen wheat, Fulghum oats, Ablyn barley, and Strain 8 rye. Five grazings were obtained.

The highest fodder yield was provided by barley, followed by oats and rye equal, and wheat was last. In the previous year rye had produced the greatest amount of fodder.

The four winter cereals were also compared at Glen Innes Agricultural Research Station, but with different varieties. Four grazings were obtained. Acacia oats produced the highest grazing yield, followed by Winglen wheat, Abyssinian barley, N.I.A.B. rye.

Wheat, Oats, Barley Pure Seed Production

Supplies of pure seed of recommended promising varieties of wheat, oats, and barley were maintained at eight Experiment Farms and Stations and distributed through Registered Seed growers. In 1962, foundation seed sowings on Experiment Farms and Stations totalled (with 1961 figures in brackets) 75 (70) acres of wheat, 44 (20) acres of oats, and 17 (9) acres of barley.

Additional to this, and associated with the pure seed production schemes on Experiment Farms and Stations, initial selection and preliminary increase of wheat and oats was conducted at Temora Experiment Farm, of barley at Wagga Agricultural College, and of some oat varieties suitable for the north at Glen Innes Agricultural Research Station.

Registered Cereal Seed Growers, operating under the recently re-organised Departmental Registered Wheat, Oat and Barley Seed Schemes, disposed of greater than usual quantities of seed from the 1962 harvest to other growers both in and outside N.S.W.

In 1962 (with 1961 figures in brackets), 119 (124) Registered Seed wheat growers working under the supervision of 21 District agronomists throughout the wheatbelt, and using foundation seed supplied by this Department, undertook seed increase of 19 (24) wheat varieties; 93 (100) Registered Seed oat growers in 22 District agronomists' areas carried out seed increase of 14 (15) oat varieties; and 20 (13) Registered Seed barley growers in 6 District agronomists' areas undertook seed production of 7 (5) barley varieties.

Maize

Inland and northern tableland crops yielded to above average. On the coast, flood losses and disease problems created an overall shortage of maize grain for feeding and manufacturing purposes. N.S.W. manufacturers called heavily on supplies from other States.

Drying conditions for the mature crop were the worst for many years and interest was taken in artificial, grain drying. Driers were installed on two farms, at Maitland and Bega, by the Electricity Authority to secure information on the practicability and economics.

Hybrid Maize Improvement Programme.—Maize material was introduced and was handled under quarantine at Leeton Agricultural Research Station.

Breeding continued at Grafton Experiment Farm and Glen Innes Agricultural Research Station. Flooding, for the second year in succession at the Grafton Experiment Farm, was a setback in most sections.

At Grafton 143 fixed late and midseason inbred lines were maintained. Eighty-seven unfixed lines were inbred for another generation.

Research for sources of new inbred material continued, and 150 open pollinated ears from eight varieties were given their preliminary testing while eight newly named inbred lines were placed in the maintenance block.

Conversion of 26 inbred lines to fertility-restoring forms progressed, but the season's work was totally destroyed by floods. Fertility-restoring forms of two important inbreds, 25 and 23, were obtained and seed-increased. The male sterile form of the inbred Y1 was further seed-increased. This made possible, by the male sterile method, commercial seed production of the most popular late maturing hybrid G.H. 128.

At Glen Innes, irrigation facilities were available for maize improvement work for the first time. Improvement of early and very early maturing inbred lines continued, and back crossed lines of inbred 701 were found to be sufficiently homozygous to name. The derivatives of inbred K4 showed promise of being more resistant to lodging than their recurrent parent.

Male sterile counterparts of inbreds 38-11 and K4 and Wf9 wx were propagated, while Eckhardt isolates of the line 701 were inbred and selected for fertility restoration.

Test crosses showed that all subject lines of the inbred 5120 were homozygous restorers.

Inbred seed to produce the hybrid N.E.H. 7 by the male sterile method was made available to seed producers for the first time.

Development of new early inbred lines continued. Forty new open pollinated strains were added to the Australian collection in store, while inbreeding was continued with the selections made last season.

Promising experimental hybrids were tested in N.S.W. and Queensland. The latest hybrids released by the Department, G.H. 128 and G.M. 211, continued to increase in popularity. About 80 per cent of the commercial maize acreage on the coastal belt was sown with these hybrids. Queensland growers' demand for seed also increased.

The hybrid N.E.H. 1178 wx, with waxy starch properties, continued to occupy the attention of starch manufacturers.

Leaf blight (*Helminthosporium turcicum*) again caused some losses in early maturing hybrids, but much less than in the previous year. The co-operative programme between breeding stations at Glen Innes and Grafton to produce a blight resistant early maturing hybrid was continued. Back crossing and inbreeding were undertaken with early maturing and blight resistant lines but the Grafton sowing suffered flood losses.

Late maturing hybrids that were developed at Grafton Experiment Farm continued to show high resistance to blight and were of great value to maize growers this season.

A school for Departmental officers was held at Grafton, primarily on the male sterile breeding programme and use of various inbred forms in commercial hybrid seed production.

Inbreds used by commercial seed producers were maintained at Grafton Experiment Farm and Glen Innes Agricultural Research Station. All demands by hybrid seed producers were satisfied.

Hybrid Maize Seed Certification.—Forty-six growers registered 517 acres under the Hybrid Maize Seed Certification Scheme, compared with 49 growers and 411 acres last season. Flood losses and bad harvesting conditions reduced the seed certified to about 12,000 bushels, as against 15,280 bushels in the previous season.

The late maturing hybrid developed at Grafton Experiment Farm continued to dominate the seed acreage sown and occupied about 70 per cent of the total area. Increased demand for seed of the G.H. 128 hybrid for commercial growing in N.S.W. and Queensland caused producers to increase its seed area by 60 acres. The G.H. 128 certified seed harvest was some 10,000 bushels, as in the previous season, and 80 per cent of the total quantity of seed certified.

The Hybrid Maize Seed Co-operative Ltd., operating a marketing pool for its members, produced about 50 per cent of the hybrid seed certified. The remainder was produced by 10 independents.

Demand for the midseason-maturing hybrid G.M. 211 again increased. Its seed acreage increased from 16 to 24 acres.

Inbreds in male sterile and restorer forms were made available for the first time, to enable seed production of the early maturing hybrid N.E.H. 7 by the male sterile method.

Inbreds for the production of the late maturing hybrid G.H. 128 by the male sterile method were further seed increased, and final arrangements were made for their distribution and use within the Seed Certification Scheme.

Hybrid Maize District Trials.—Forty-seven trials for grain production were organised. These included seven with very early, 12 with early, 14 with midseason and 14 with late maturing hybrids.

The Queensland Department again co-operated by testing Departmental hybrids and inbred material on the Atherton Tablelands.

The late maturing hybrid G.H. 128 performed best in trials. It gave a mean yield of 96.3 bushels over seven trials. G.H. 134 was next best with 93.8 bushels. Experimental hybrids did not yield as well as these two commercial hybrids.

Hybrid G.M. 211 performed very satisfactorily in trials and in commercial areas. Seed production was unable to meet the increasing demand.

The early maturing hybrid N.E.H.7 maintained its yield and popularity in some districts, while N.E.H.6 lost favour. Experimental hybrids N.E.H.1066 and N.E.H.1004 yielded highly, better than N.E.H.7, but there were seed production difficulties with the main parental inbred, B15. N.E.H.1178wx impressed growers with its yield and field characteristics, and seed was produced for further investigations.

Very early maturing hybrids that were developed for inland and short-seasoned tableland districts gave very disappointing yields. Release of a hybrid in this group for commercial production has been delayed.

Field performance of hybrids developed by the male sterile method were compared with their normal counterparts in trials at three centres. No difference was detected.

Shand Selected Seed Company hybrids performed well in trials and in commercial areas, particularly in the Mudgee district. D.S.303 was the most popular. No new hybrid was tested for the Company.

Use of fertilizers was again investigated, with mixed results.

Superphosphate was in normal use by commercial producers and proved economical, but the economics of nitrogen application were governed by seasonal and soil conditions.

Chemical weed control commanded greater interest. Trials conducted in co-operation with commercial interests were spoiled by wet conditions and flooding. Many inland growers adopted chemical weed control methods. Coastal growers were less interested.

HYBRID SWEET CORN

Production.—The area increased to about 2,000 acres. Main producing areas were Tumut, Gundagai, Windsor, Richmond, Bathurst and Mudgee. Production was the best for several years, despite leaf blight (*Helminthosporium turcicum*).

Keen competition existed between canning firms and demand for better quality hybrids was intensified.

Hybrid Iochief popularity increased still further. Seed supply was insufficient for the demand. Hybrid Golden Cross Bantam lost favour with growers and canners.

Seed Supply.—Inbreds for production of Iochief were maintained at the Yanco Agricultural Research Station, but demand exceeded supply. Growers and firms were encouraged to maintain their own inbreds, and mother seed was made available to some for the purpose.

Inbred seed for production of improved sweet corn hybrids was again introduced. New controls for production of Iochief were found to be superior in some respects to the seed in commercial use. Arrangements were made to replace the old seed with new.

Canners and seed firms were helped to introduce and test new sweet corn lines to cater for their own processing requirements.

Registered Seed Certification.—36 acres were registered for seed certification, compared with 27 acres the previous season.

HYBRID POPCORN

Production.—Production was estimated at 22,000 bushels from 1,200 acres, a slight increase on the previous season. The main producing centres were Glen Innes, Armidale, Tamworth and Mudgee.

Increased Processor Interest.—Activity by processors increased. Blevins Popcorn Company of Illinois, U.S.A., interested itself in Australian production and associated with E. S. Purkiss and Sons with headquarters at Armidale. Assistance was given to Blevins Purkiss Pty. Ltd. in sowing of new inbred material under quarantine. Processing machinery was also imported by the new company and located at Armidale.

Grain Sorghum

Production.—Adverse seasonal conditions resulted in reduced acreage and less production; 62,000 acres were sown, compared with 70,000 acres in the previous season.

Yields of 100 bushels and better were again reported from some early sown crops, but the crops sown late were disappointing.

The main grain sorghum producing area was in the north-west but interest increased in southern irrigation districts. There it was found useful in development of new irrigation area. Severe lodging occurred in some north-western districts. The cause of lodging was not determined.



Hybrid Grain Sorghum Research, Tamworth Station

Tamworth Agricultural Research Station has undertaken a grain sorghum improvement programme; including overseas and interstate introductions and exchanges, development of hybrids, and selections.

Hybrids Increase Interest.—Interest was stimulated by availability of hybrids. Demand for hybrid seed exceeded supply. More than $\frac{1}{3}$ of the acreage sown was with hybrids.

Variety Trials.—Trials throughout the State again indicated that hybrids yield 25-30 per cent higher than open pollinated varieties. Hybrid Tx610 was outstanding, giving a yield increase of 35 per cent over variety Alpha and 47 per cent over variety Caprock. Hybrid Brolga was little inferior to Tx610.

The Shand Selected Seed Company of Armidale, in association with DeKalb of U.S.A., commenced hybrid sorghum seed production. Its hybrids F63A and C45A were tested in trials, but appeared inferior to Tx610 and Brolga in initial tests. Seed production by the Shand Selected Seed Company during the winter months on the Burdekin in North Queensland was a big factor in building up its seed supplies.

Seed Certification Scheme.—A Certification Scheme for hybrid grain sorghum was initiated and 500 bushels of Tx610 were produced in N.S.W. in this initial year.

Aerial Pest-Spraying.—Aerial spraying with DDT and malathion was practised by some landowners, but the economics of it were uncertain.

Grain Sorghum Improvement Programme.—Improvement of sorghum grain types was undertaken at the Tamworth Agricultural Research Station. A range of grain types was introduced, mainly from U.S.A. An exchange of material with Queensland Department of Agriculture and Stock assisted the work.

Back crossing to produce male sterile waxy lines was continued. Crosses to introduce the fertility restoration factors to waxy lines were made but subsequently destroyed by birds.

Five grain sorghum hybrid combinations were made while seed of hybrid male-sterile lines was produced and maintained.

The Introduction used.—These included male-steriles and their corresponding fertiles, with quadruple dwarf types, restorer lines with quadruple dwarf and smut resistant varieties. Other varieties were lines with yellow endosperm, waxy starch, and midge resistance.

Fodder Sorghums

Grazing Use Increases.—The use of sorghums State-wide for grazing was greater than ever. *Sorghum alnum*, sudan grasses, sweet sorghums and the new DeKalb hybrid Sudax provided excellent summer grazing.

Interest in the use of *Sorghum alnum* declined. Few new areas were sown, but many established areas continued to provide good grazing.

Sweet sorghums increased in popularity in inland areas. Areas of 50 acres for summer grazing were not uncommon in the north-west of the State. The variety Sugardrip was very popular and gave excellent grazing results. The variety Tracy introduced from U.S.A. was included in recommendations for the first time, following trial results.

The new DeKalb hybrid Sudax, seed of which was produced by the Shand Selected Seed Company, gave excellent results in its first season and the area sown increased considerably. In trials in various districts the hybrid was liked by stock, recovered well after grazing and gave a high yield of fodder.

Seed Production and Supplies.—Good stocks of Certified *Sorghum alnum* seed were held by seed merchants, but there was buyer resistance because uncertified cheaper seed was readily available.

The final selection work was done on the sweet sudan SS6, and this line was seed increased for incorporation into a new Seed Certification Scheme.

Seed of the sudan grass variety Lahoma was produced on a commercial scale for the first time. This was the follow-up to good performance in district trials.

Seed certification of sweet sorghum continued. 1,600 bushels were produced, including 958 bushels of Saccaline, 623 bushels of Early Orange and 21 bushels of Tracy. Certified seed fell short of requirements.

Fodder and Forage Sorghum Improvement Programme.—Work to improve fodder and forage sorghums was intensified at Tamworth Agricultural Research Station. Varieties and

male sterile lines were introduced, and used in the breeding programme. Material was exchanged with Queensland Department of Agriculture and Stock, and also supplied to India.

Experimental sudan grass and sweet sorghum hybrids were made and yield tested. Five sudan grass varieties, Lahoma, Piper, SS6, Late SS6 and Tift, and the sweet sorghum varieties Sart, Sugardrip, Leoti, Early Orange, Tracy and Saccaline, were used in combinations with all available male-sterile grain sorghums.

In this first year of trial sweet sorghum hybrids did not yield much higher than varieties, but had a higher dry matter content. Hybrids were intermediate between the pithy stemmed grain sorghum and the juicy stemmed sweet sorghums. At flowering time, refractometer readings showed that hybrids had a slightly higher sugar percentage than varieties.

Sweet sorghum hybrids all were two weeks earlier maturing than the varieties and much stronger in the stem. Up to 80-90 per cent lodging occurred with the varieties, while no hybrid lodged more than 20 per cent.

A comparison of experimental sudan grass hybrids, sweet sorghum hybrids, recommended varieties and DeKalb hybrid Sudax showed several hybrids to be equal to or better than recommended varieties and hybrid Sudax in yield. Hybrids with the sweet sudan varieties Lahoma and SS6 showed up promisingly, while male-sterile lines A378 and A3048 showed up as the best seed parents.

Grain Millets

Interest in grain millets has increased because of the expanding bird-seed trade.

Trials indicated the varieties Dwarf Setaria and White Franch to be best for grain production.

Experimental areas of grain millets in the southern irrigation districts indicated that the crop has possibilities in that region. It is conveniently situated to cater for the Victorian market without excessive freight costs.

Breeding Programme.—Millet improvement work continued at Tamworth Agricultural Research Station.

Fifty-seven lines were received from the C.S.I.R.O. and five from the U.S.D.A. for testing. Lines introduced from the U.S.A. were parent lines of the hybrid Gahi I and a male-sterile. The C.S.I.R.O. material contained lines similar to material of the hybrid Gahi I, but not superior to the Tamworth Agricultural Research Station's selections.

The variety Katherine obtained from the C.S.I.R.O. appeared to be superior to Starr pearl and did not show similar disease symptoms.

Vetches

The acreage sown to vetches again increased. An estimated area of 20,000 acres was sown in the North Coast region for supplementary feeding to dairy stock during the late winter-spring period.

Disease and poor nodulation caused some set backs and were subject of investigation by Division of Science Services.

Demonstrations.—Twelve demonstrations using D.I.E.G. funds have been conducted in coastal districts. Farmers were impressed. The demonstrations have fostered the popularity of the vetch crop and helped to extend its acreage.

Varieties and Strains in Grazing Trials.—Golden Tares occupied most of the area sown for grazing throughout the coastal region. Trials with other strains showed that *Vicia sativa* (Languedoc) accessioned P792, *Vicia sativa* (Early) P4297, *Vicia sativa* (Nyabing) P4298 and *Vicia dasycarpa* P788 were promising. Nodulation problems with *Vicia sativa* (Nyabing) P4298 indicated that it required a rhizobium other than that in commercial use for Golden Tares.

Comparative grazing trials with Golden Tares and other strains indicated big variations in palatability for dairy stock. The strains *Vicia dasycarpa* and *Vicia atropurpurea* appeared to be particularly unpalatable. Also, some other strains were apparently quite palatable except when approaching maturity.

Seed Supply Problem.—Only small quantities of Golden Tares seed were produced in N.S.W. Seed is imported from Tasmania.

Southern Region farmers at Grong Grong, The Rock and Wagga produced seed of earlier vetch strains, under dryland conditions. More interest in utilisation of vetches is apparent in inland districts.

Improvement Programme.—Vetch introductions were made. Tests of their disease resistance, and grazing and yield ability, together with seed production potential, were continued at Grafton Experiment Farm and at Yanco and Wollongbar Agricultural Research Stations.

Cowpeas

Interest increased. The acreage sown for seed and grain production expanded. Grain yields of 12-15 bushels per acre were common. There was some export demand for grain, mainly for food in Italy.

The variety Poona was most grown. There was notable increase in acreage of Malabar, Havana and Blackeye 5 harvested for seed.

In trials, Malabar, Havana and Blackeye 5 were satisfactory for fodder production, but in some trials their seed yield was inferior to that of Poona.

Stem and root rot diseases killed out considerable areas of cowpea coastal plantings. Havana, Malabar and Blackeye 5 showed some resistance, but succumbed to the disease under severe conditions.

Seed of Caloona, reported to be disease resistant, was sown at Tamworth Agricultural Research Station. Its vegetative growth and seed production were disappointing.

Tests in southern irrigation districts showed flat sowing of cowpeas to be inferior to the bedding-up system.

Field Peas

More farmer inquiries were received on growing of field peas, because of increasing demand for protein meal.

Trials indicated the variety Dun to be superior to others tried for seed production and fodder yield.

Yanco Agricultural Research Station tests indicated the crop's grain production potential under irrigation, and that May is the best month for sowing.

Cotton

Increased Acreage.—From 201 acres in 1960-61, cotton production in N.S.W. advanced to reach 1,956 acres in 1961-62 and 2,600 acres in 1962-63. A further big increase is likely in the forthcoming season. Growers have declared intentions that indicate 10,000 acres in 1963-64. Main centres of production are the Wee Waa-Narrabri area in the north-west and irrigated districts in the south-west.

For a highly specialised crop this has been a remarkable development, especially since high capital investment is involved. Moreover, the development is despite the unfavourable results from past attempts to produce cotton as a rain-grown crop.

Yields.—The season was most unfavourable. It seriously affected plant growth and delayed harvesting. Over-all yield average has been estimated as 1,500 lb. seed cotton per acre; a record for an Australian State. Yield average in Queensland has rarely exceeded 400 lb. per acre, because a high proportion of the crop there is grown under rainfall conditions.

Quality Emphasis.—The Department has emphasised to farmers the need to produce a high-quality fibre. Accordingly, Departmental research and extension workers have been pleased by the favourable reports from spinners on the high-quality commercial fibre now being produced under irrigation in this State.

So that Departmental cotton breeding and research may be soundly based to guide farmers, a cotton testing laboratory will be established at Rydalmere.

Pure Seed Programme.—During the year, a cotton pure seed programme was commenced with several varieties that had shown promise in earlier trials. By 1964 there will be sufficient pure seed of the variety Empire 289 to sow the entire

N.S.W. crop. Other varieties have been included in the programme, to help selection of a best variety for New South Wales, or one for the northern and one for the southern areas, possessing the most suitable field, yield, and fibre characters.

The proven "one-variety district" scheme of other countries has been accepted by grower organisations. Pure seed production by them is being organised under Departmental supervision.

Cotton Breeding.—A cotton plant breeder position was created in 1958. The breeder has continued comparative testing, improvement and multiplication of a large number of introduced varieties and selections.

A direct result of the variety improvement programme has been substantial production of pure seed of several varieties, including the promising Empire 289 and Deltapine Smoothleaf. Meantime the long-range programme of breeding special varieties for N.S.W. conditions has progressed, particularly in the selection of promising parent material for further cross-breeding.

Cotton Production Research.—Research into cotton production problems proceeded at Yanco Agricultural Research Station and Narrabri Experiment Farm.

At Yanco: In the "method of irrigation" trial the highest yield average (2,172 lb. per acre) was from the plots that received high levels of water throughout the season.

Stoneville 2B was the only variety that outyielded Empire, the standard.

Further valuable information on chemical defoliation was gained, particularly as to different effects of the various chemicals used.

At Narrabri Experiment Farm: The detailed research programme covered many north-western production problems. This programme included an evaluation of defoliant, a comparison of seven promising varieties with the standard Empire, plant population studies, irrigation timing and frequency, and varied fertilizer levels.

Research other than at those two institutions was confined to detailed fertilizer trials in the south west and a variety trial in the north west at Wee Waa. In the latter, Deltapine Smoothleaf topped the yields with 3,835 lb. seed cotton per acre, followed by Empire 289 at 3,412 lb. Empire 289 was superior in fibre length and uniformity.

Field Trials of Cotton.—Plots subsidised and supervised by this Department were established on farms to gain information on the crop's reaction to the various climatic and soil conditions of the north west, central west, south west and far western districts.

Ginnery Established.—A modern ginnery, with two gin stands but capable of four, was constructed at Wee Waa. Thus, costly transport from the north west to Brisbane, and associated loss of quality, are no longer limiting factors.

Negotiations also proceeded in the south west towards financing ginnery construction there for the forthcoming season.

Secondary industries have displayed considerable interest in cotton seed as a source of oil and high protein meal.

Extension Advice.—There is still much to learn about the cultivation and production of irrigated cotton in New South Wales environments.

During 1962-63, the Department stationed an agronomist in the U.S.A. for 12 months under the auspices of U.S. extension personnel. He intensively studied production, harvesting, and extension methods and secured a fund of information invaluable to the Department's work. He is now stationed in the Narrabri-Wee Waa cotton areas but will also travel to and give advice to farmers in other parts of the State.

Rice

Research.—The intensive research programme continued at Yanco Agricultural Research Station and in the rice districts. The programme comprised some 40 projects and trials. Rice industry organisations continued their financial support.

Caloro II trialled slightly superior to Calrose and Late Caloro and the three were superior to Wombat and Bluebonnet 50.

The economic, yield increases from fertilizer trials, particularly on "new" soils, have been widely accepted in the recently developed Coleambally and Kooba settlements and this will further increase the yields from these already high yielding areas.

Recent investigations had shown excellent control of Barnyard Grass by a new herbicide but the high cost has hindered grower acceptance. Research has therefore aimed to define the intensity of infestation at which economic, yield increases could be anticipated.

Time-of-drainage trials have shown that early draining of rice crops reduces yields and also depresses grain quality.

Sod-seeding has been shown to produce high yields. The method avoids costly land preparation and allows additional grazing up to time of sowing. Research has been directed at determining the reaction of varieties to it, and the optimum seeding and fertilizer rates.

Plastic levees in an experiment were successful in lieu of normal earth banks. The method has to be examined under field conditions, in association with an economics study, before commercial adoption is recommended.

Other rice research projects on hand include: management of aerially sown rice, seed treatment, top-dressing, and blood-worm control.

Rice Breeding and Improvement.—The rice breeder's major project has been a fundamental study of the causes, mechanism and genetics of sun-cracking.

Research had previously demonstrated that harvesting at a high moisture content and subsequent aeration to a safe moisture storage level would considerably reduce the losses sun-cracking causes. This research also showed that varieties differ widely in their resistance to sun-cracking. Therefore it is hoped that resistance may be bred into varieties. This long-term project continued in the past year together with work to establish criteria for retention or rejection of breeding lines.

A special microscope and associated equipment donated by the rice industry have facilitated studies also of the cellular structure of rice grain.

About 800 lines of advanced cross-breds were grown. Six of these show sufficient promise to be promoted to large-scale testing. Excellent performance of some long-grain cross-breds was of considerable interest. These could replace Bluebonnet 50, due to their superior yield and quality.

The need for accurate laboratory techniques for determination of quality standards is subject of co-operative research with the rice chemist.

The programme of introducing and testing new varieties developed overseas continued. To preserve the unique disease-free state of the N.S.W. rice industry these lines are grown under quarantine at Hawkesbury Agricultural College prior to despatch to the Yanco Agricultural Research Station.

Rice Soil Testing.—Progress was made in developing an accurate laboratory technique to analyse rice soils and forecast optimum requirements of nitrogenous fertilizer. Apart from the detailed research by the rice chemist, about 100 crop areas were sampled and analysed. The results were used by District agronomists to estimate rates of fertilizer application.

Rice grower organisations valued highly the progress in this major project. Their financial support subsidised the establishment of the rice research laboratory and continues to subsidise its work.

Rice Industry Trends.—The 1962-63 rice crop yield average was below that of the previous three seasons but remained superior to rice growing countries throughout the world.

Willingness of the growers to accept new techniques and findings remains a striking feature.

The industry's efficiency was reflected in its ability quickly to alter production to suit changes in consumer taste at home and abroad and produce great quantities of the medium-grain, Calrose, and the long-grain, Bluebonnet 50. The entire industry had been based previously on the high yielding, short-grain variety Caloro.

Facilities to receive paddy rice at high moisture into bulk installations equipped with aeration devices have further increased. New plant, valued at £120,000 has been built at Griffith, existing plants have been enlarged. Following the Department's earlier research results, the industry has in seven years invested more than £1 million in such installations.

Oil Crops

Safflower.—Australia's annual requirements have been estimated at 10,000 tons, and the value of imports over recent years has varied between £250,000 and £500,000. Australian production has rarely contributed more than 25 per cent of total requirements. Local oil processors have recently been keen on promotion of this crop in New South Wales.

Only 300 acres was sown in 1962, but high oil content of the new variety Gila has attracted new interest. Arrangements have been made for pure seed increase of this and other leading varieties in several districts. Six new varieties of reputed high oil content were introduced and grown under quarantine.

District agronomists conducted trials with farmers to determine the crop's suitability under varied climatic conditions.

Linseed.—Reports from District agronomists indicate that linseed growing spectacularly increased from 7,266 acres in 1961-62 to more than 20,000 acres in 1962-63, the largest sowing for several years. Excellent yields were reported. Some districts averaged 16 to 18 bushels per acre. Individual crops reached 24-25 bushels per acre.

Revived interest in the crop created intense demand for pure seed, and justified the special efforts to start a seed scheme and distribute pure seed for increase by co-operating growers under supervision by District agronomists. Varieties included in the scheme were Walsh, Bonnydoon, Hazeldean, Uruguay, Calar and C1118.

A world collection of linseed varieties and strains has been assembled over the past three years. From the collection, 300 special selections were made at Yanco Agricultural Research Station and 230 at Glen Innes Agricultural Research Station. These have been resown for further comparative testing and seed increase purposes.

The breeding programme, to develop resistance to "pasm" disease, continued. Also, further selections were made from lines produced in earlier programmes. These too will undergo comparative testing. A new programme, using winter linseeds and large seeded linseed with "pasm" resistant material, has been started.

District agronomists conducted twelve variety trials on farms. The standard variety, Walsh, performed well but was out-yielded in some centres by Marine and Lin-de-Tunis. The new variety Bonnydoon showed high yielding ability in seed increase plots. It attracted considerable farmer interest. Where growing conditions were satisfactory, variety trial yields exceeded 15 bushels per acre. The highest yield, 29 bushels per acre, was in an irrigated trial at Griffith.

Sunflowers.—Although the seed provides a high quality edible oil, the main outlet has been the bird-seed trade. Only in occasional, high production seasons has oil extraction occurred.

In the past year 1,500 acres were sown to sunflowers, as against sixty-eight acres in 1959-60. Early-sown crops yielded 1,000 lb. per acre. Late-sown areas suffered from dry conditions and disease.

Arrangements were made to introduce, under quarantine, new varieties and hybrids to test their grain and oil yields under New South Wales conditions.

Soybeans.—The present, annual requirement of soybeans in Australia has been estimated as 10,000 tons. The largest crop produced for many years was in 1959-60. It totalled less than 500 tons.

The crop deserves attention due to high oil content of the grain, the meal's excellence as a protein source of particular interest to the poultry industry, and the value of the legume in crop rotations. Although only 150 acres was planted in the past season widespread interest has developed, particularly for irrigated conditions.

District agronomists conducted variety and demonstration trials on farms, to establish the suitable varieties for various parts of the State.

Soybean improvement work was conducted on a limited scale at Glen Innes Station. There, fifty-nine single plant selections were grown and new selections were made for high yielding, early maturing types. A large collection of varieties was transferred to Yanco Station. There, preliminary testing for varietal suitability for the south-west, under irrigated conditions, was undertaken.

Irrigation will determine the future of the soybean industry. High, experimental yields of 30 to 40 bushels per acre have indicated the potential.



Linseed Competition Crop

Linseed acreage in New South Wales spectacularly increased from 7,266 acres in 1961-62 to 20,000 acres in 1962-63, the highest for many years. Some crops reached 25 bushels per acre. Revived interest in linseed has justified a special effort to start an official pure seed scheme.

Tobacco

During 1962-63, the New South Wales tobacco growing industry experienced mixed results, and uncertainty as to the future. Indiscriminate buying of leaf, with little regard for quality, is no longer prevalent. Offerings of doubtful quality are no longer sought.

Blue mould resistance combined with quality formed the major goal of the breeding programme. Following manufacturers' adverse comments on the leaf quality of this Department's blue mould resistant strains, further back-crossing to the accepted Hicks was continued, to regain the Hicks smoking quality in blue mould resistant strains.

Work with fertilizers, insecticides and fungicides continued. With manufacturers' co-operation, the possible tainting in cured leaf sprayed for the control of blue mould was investigated.

The pure seed programme continued, and a select Hicks strain should be available from the Department for distribution in 1964-65.

A Research agronomist is now located at Ashford, in the centre of the northern tobacco growing districts. He has initiated work on the field needs of the tobacco plant, its fertilizer needs, and factors that influence cured leaf quality.

In co-operation with the Electricity Authority of New South Wales the economic and practical aspects of electricity as a source of heat for curing tobacco are under experiment.

£40,000 has been available to the Department from the Tobacco Industry Trust Account, to establish the Tobacco Research Station at Ashford. A property has now been selected. Purchase may be completed and work on the Station may have commenced before the next tobacco growing season.

The Commonwealth has provided money to employ a Tobacco Extension Officer for work in the Murray Valley tobacco growing district. An appointment has been made. After an induction period the appointee will take up duty at Barham.

Some Miscellaneous Plants

Canary Seed.—Production areas increased from 539 acres in 1961-62 to about 1,500 acres.

Peanuts.—Acreage declined, and yields were low because of heavy rains at harvest.

Corkwood (*Duboisia* spp.).—Production became more active on the north coast, where the demand exceeded supplies naturally available. Establishment of a Corkwood plantation has attracted considerable interest.

Others.—Ramie, Oil Poppy, Giant Lily, Tung Oil trees, Castor Beans, Mentha, Lavender and Pyrethrum were among other crops to which some investigatory attention was given.

Vegetables

GENERAL

For the last four months there has been almost continuous wet weather in most coastal districts. This not only destroyed crops established earlier but prevented all cultural operations. As the twelve months under report closed there was very little production from near metropolitan market gardens, and the coastal acreage of seasonal crops was only a fraction of normal.

Windsor growers, severely affected by floods in the last two years, were in a parlous position. They have had little income for two years and have been unable to prepare land for potatoes, their chief cash crop.

The vegetable breeding programme at Hawkesbury Agricultural College was also severely impeded. Continuing rain prevented crossing, and caused unthrifty growth in crossbred material. Instead of the usual two bean crops per season, only one successful crop has been grown in the last two years. It has even been difficult to maintain seed stocks.

POTATOES

New Research Station Site.—An area of 367 acres, three miles from Orange has been acquired for a Potato Research Station where cultural methods, nutrition, storage, and control of diseases, pests and weeds will be studied. Seed of high quality will also be produced there for release as foundation seed to growers of certified seed.

Early costs of establishment are to be met from the funds of the former Potato Marketing Board of New South Wales, which amounted to about £11,000.

Release of New Variety.—The white skinned seedling S2854, a selection from Sequoia x 11-79 was named Kurrel and released to commercial growers. It is of late maturity, has some field resistance to early and late blights, and produces a high yield of uniform, high quality tubers. It is best suited to maincrop areas in tableland districts.

Breeding Programme.—At Glen Innes Agricultural Research Station 245 individual crosses were made and 660 seed balls were harvested. More than sixty different parents were used, in as many combinations as possible.

Female parents included Erendira, Excel, Kennebec, Tawa and B595-76 from the United States of America, Fund from Canada, local varieties Bungama and Kurrel, and advanced locally developed seedlings.

As male parents, extensive use was made of Saco, Cherokee, B2067-52 and X927-3 from the United States of America, 914(a)12 from Scotland, and a range of advanced local selections.

Close survey of the potentials of different parental lines has made possible an overall decrease in the number of parents. More local selections and fewer introductions are being used. The United States of America breeding line B595-76 has remained most valuable as a female parent. Many of its progeny are being used as parents.

Some 15,000 *first-year seedlings* were grown in the glass-house this year. Progenies of particular note were derived from the United States of America lines B595-76, B3299-13, B3095-18 and Onaway, and from locally developed lines S2856, S2782, S2864 and S2821.

From the 2,300 *second-year seedlings*, grown at the substation, 130 selections were made. Lines that appeared most promising were from Russet Sebago x Menominee, Furore x Redskin, (1928(e)2 x Menominee) x Redskin, Kurrel x Osage and Onaway x Exton.

From the 348 *third-year seedlings* planted at the substation during the season eighty-five promising selections were made. The few selections made from Onaway x S2856 were of particular interest, with excellent shape and quality and very shallow eyes. Other very attractive seedlings were selected from B3095-18 x S2856, Walanga x B2067-52, and B3095-18 x Adina. Local seedling S2856, from Monak x 11-79, continues to produce excellent results when used as a male parent.

From the 115 *fourth year seedlings* planted at the substation 38 selections were made. The four lines selected from B595-76 x Adina, three from B595-76 x S2782, and two from S2654 x Cherokee were particularly outstanding.

Yield Trial and Disease Tests of Advanced Seedlings.—A preliminary yield trial of outstanding advanced seedlings was done at Red Range in an early maturing and a late maturing section. The most impressive seedlings were S2897 (Redskin Nat. Pollination), because of the very attractive shape of its red skinned tubers, S2899 from Walanga x Merrimack for its outstanding yield, and S2904 from B595-76 x S2782 for its very attractive round, shallow eyed, russetted tubers. S2904 is highly resistant if not immune to the common races of late blight.

Forty-four of the advanced seedlings were tested by Biology Branch, Division of Science Services, for resistance to the common races of late blight. Eighteen of them were highly resistant if not immune to the races used. Resistance was derived from the U.S.A. lines Kennebec, Merrimack, Pungo, Saco and B595-76 and from the Scottish line 1928(e)2.

Field testing of advanced seedlings and introduced varieties for resistance to common scab was recommended on the central tablelands. The introduced varieties Haig and Huron proved to be highly resistant as also were the local seedlings S2886 from Menominee x Redskin and S2888 from 11-79 x Redskin.

Potato Introductions.—Twenty-nine new varieties and breeding lines were introduced from overseas this year. Of those tested at Glen Innes, Fundy and F4724 from Canada did well, as did Norland, Excel, Bounty and Navajo from U.S.A.

Potato Fertilizer Trials.—A further 20 trials in the series of Potato Uniform Fertilizer Trials were conducted in various districts. These trials are comparing all combinations of 0, 4, 8, 12 cwt. superphosphate, 0, 1, 2, 3 cwt. sulphate of ammonia, and 0, 2 cwt. sulphate of potash.

In previous seasons the source of potash was in most cases the chloride salt. This season, using the sulphate, marked responses were obtained in the grey soils at Blayney, in yield and in appearance. Chemical analysis showed 1.88 per cent potash in leaves from plots that received the fertilizer whilst those from untreated plots had only 0.34 per cent. Marked deficiency symptoms were evident in the latter. In the trial at Dorrigo potash significantly boosted the yield, whilst at Maitland and Comboyne there was a slight response. It seemed that the sulphate is to be preferred to the chloride as a source of potash.

In higher rainfall areas such as Dorrigo and Hernani and where irrigation is practised, as at Maitland and Windsor, there have been marked responses to the higher levels of nitrogen, whilst on tableland crops 1-2 cwt. proved adequate.

Phosphorus requirements were higher in tableland areas than in coastal irrigated crops.

Potato Seed Certification Scheme.—Increased acreage was submitted for certification this season; 1,650 acres were submitted by 146 growers as against 1,320 acres by 131 growers in 1961-62. Finally 1,280 acres were certified, reflecting a rejection rate of 16.4 per cent compared with 16.6 per cent in the 1961-62 season. The main reason for rejections this season was an excess of leaf roll, particularly on the central tablelands. In the previous year the high rate of rejection was due mainly to adverse weather. In 1961/62, 45,921 bags were sealed, compared with 40,443 bags in 1960/61. Sealing of the 1962-63 crop is just commencing.

District Variety Trials.—Because of a disease occurrence in the seed increase plots at Orange it was not possible to carry out district variety trials on the usual scale.

In tableland trials of early maturing types the U.S.A. variety Kennebec and the locally developed Crana performed very well. Of the newer seedlings S2889 from B595-76 x Adina and S2890 from Sequoia x Cortland gave promising results. Amongst the later maturing lines, the newly named Kurrel and the recently named Bungama continued to do very well in tableland areas. Of the more recently developed seedlings the S2856, S2879 and S2882 selections from Monak x 11-79 and the red skinned S2884 selection from Murru x Adina all performed very well.

In coastal trials, Kurrel and Gungama gave good results where a later maturing variety was needed. Exton, S2860 from 835a-4 x Adina and S2848 from Monak x 11-79 showed up well where an earlier maturing type was preferred.

Potato Quality Tests.—Nine varieties and seedlings were included in the comprehensive cooking tests conducted by the C.S.I.R.O. In the overall organoleptic rating S2870 from Monak x 11-79 was placed first, followed by Sequoia, S2868 from S2540 x Adina, and Sebago. In specific gravity determinations S2864 from Monak x 11-79 was best with 1.103 followed by Bungama (1.102), S2869 (1.100) and Kurrel (1.098). In mean total solids content S2869 from Monak x 11-79 was best with 25.41 per cent, followed by Bungama (25.04 per cent), S2864 (24.27 per cent) and Kurrel (23.47 per cent).

An unusual feature was that the relationship between overall organoleptic rating and specific gravity was inverse rather than direct.

Specific gravity determinations were made on the varieties and seedlings in some variety trials. At Orange, Saco, Merrimack, Delus, Kennebec, S2869 and Kurrel were all superior to Sebago. At Millthorpe, Kurrel, S2856, Murru and S2869 all gave high readings. At Crookwell, Sebago, S2840, Kurrel and S2868 were best.

The tendency mentioned in last year's report for potatoes from the tableland areas to have a higher specific gravity than those grown under coastal conditions was confirmed this season.

Programme to Produce "Elite" Seed.—Apparent superior lines of the varieties Sebago, Bungama, Kennebec, Sequoia, and Exton were selected in crops of known good quality in various areas. Further selection was done at harvesting time. The resultant tubers were planted on a tuber unit basis at Orange. These have been harvested, with more selection. The products have been reserved as a nucleus for "elite" seed production.

TOMATOES

Breeding Programmes.—These continued at Yanco Agricultural Research Station and Hawkesbury Agricultural College. At the College, due to continuing months of abnormal rains, very few new crosses and backcrosses were successfully made.

In a trial there were 28 varieties, 16 F_1 generation hybrids and 35 crossbred lines. The hybrid of Grosse Lisse x Valiant was the best. The hybrids of Anahu, Indian River and Step 286 with Rouge de Marmande showed an average increase of 55 per cent in yield over the male parent. Of the newer hybrids, the best were Kokomo x K.Y. 1, Kokomo x Rhode Island Early and Step 274 x Rhode Island Early.

From the 35 segregating *Fusarium* wilt resistant crossbred lines, 34 new selections were made. Two lines of Rouge de Marmande x L. pimpinellifolium, one of them backcrossed once and the other twice, were tested at Leppington and Maitland. Both showed promise. They were able to set fruit under cool conditions, and were highly tolerant to *Fusarium* wilt.

Eight varieties and four hybrids were tested in the glasshouse during the winter. The most impressive were Potentate from New Zealand and V548 and Vinequeen from Canada. Of the hybrids, Break O'Day x Rouge de Marmande and Anahu x Rouge de Marmande were outstanding. The latter was highly tolerant to nematodes.

Yanco Agricultural Research Station continued the effort to develop *Fusarium* resistant, determinate type tomatoes suitable for pulp, canning and juice. To develop a variety with a small bush and highly concentrated maturity to suit mechanical harvesting, H.1370, VF145-22-8, VF145, VF145-21-4 and others were crossed with Y.T.M.F. 8. Promising selections made from the *Fusarium* resistant lines included four from the F_8 generation of Bounty x Kokomo, two from the F_7 of Pan America x Moscow and two from the F_4 of Roma 884 x Red Top.

Tomato Variety Trials.—In a canning tomato variety trial at Yanco, two selections from Tatura Dwarf Globe x Pan America gave much higher yields than their parents; while Y.T.M.F. 8 produced the highest rate of first good fruits, with 85 per cent of the total yield in the first four pickings.

In a trial to determine the suitability of 10 varieties for mechanical harvesting, Y.T.M.F. 8, VF145, VF145-22-8 and Roma 884 showed most promise, because of their growth habit and uniform ripening.

At Leeton and Griffith the Yanco selection of Roma (Roma Y.S.) proved superior to the commercial variety Roma 884 in yield, fruit size, and sun scald susceptibility. Its resistance to *Fusarium* was again demonstrated. It was also tested by Gordon Edgell & Sons Ltd. at Cowra. There it out-yielded Roma 884, produced better quality fruit, and was higher in soluble solids.

Radio-active Isotope Induction of Male Sterility.—Work continued at Hawkesbury Agricultural College to determine the possibility of using radio-active isotopes to induce male sterility. Three lots of 70 seeds were treated with P32 for varied periods and grown in the glasshouse. Many abnormalities were apparent in the resultant seedlings, including apparent sterility. Cuttings were taken periodically from the five sterile and the nine semi-sterile plants and were grown in the field. On the field-grown plants, 21 intercrops were made and 12 of these are being grown for observation. All R_1 generation seed is being retained for further observations.

Tomato Introductions.—Of the several varieties from overseas and local sources tested at Hawkesbury, Vogue from Canada, and Summer Sunrise and Campbell 146 from U.S.A. were best. At Yanco, Chico and VF145-22-8 proved suitable for canning or pulping and for mechanical harvesting.

BEANS

Breeding Programme.—Hawkesbury Agricultural College bean breeding was again considerably curtailed by flood rains in spring and autumn. It was difficult to assess the merits of the numerous crossbred lines. Those that showed promise

were some fixed lines from Fullgreen x Brown Beauty resistant to anthracnose, and selections from the F_5 generations of Stringless 24 x College Supreme, Redlands Beauty x College Supreme and College Supreme x Disease Resistant W89. Testing of single plant selections for resistance to anthracnose strains 1 and 2 was continued in the glasshouse during the winter.

At Yanco Agricultural Research Station 14 white seeded selections were made from the F_7 generations of various crosses, including Processor x FM-2, Seminole x FM-1 x Seminole, Slendergreen x FM-1 and Contender x FM-1. A root-rotting complex involving *Fusarium*, *Macrophomina*, *Rhizoctonia* and *Pythium* species has caused widespread losses in recent years in stringless bean crops in inland districts. Though commercial varieties included in the Yanco trial showed marked effects from this root-rot complex, only one line of breeding material of FM-1 parentage was affected.

As FM-1 is of outstanding quality for processing, the FM-1 material's freedom from attack by root rots was most pleasing. Amongst commercial varieties grown in observation rows, only Harvester, Slendergreen, Seminole and Tenderlong L5 showed no rootrot.

Introductions.—No introductions were made this year. Of introductions made in recent years, Harvester from U.S.A. and Redlands Greenleaf from Queensland again performed well in Hawkesbury College tests.

French Bean Seed Certification.—There were further declines of acreage and production of certified seed. Only 83 acres were submitted for inspection as compared with 185 in 1961-62. Sixty-three acres were passed for certification, as against 38 acres in the 1961-62 season; but only 193 bushels were sealed, compared with 750 bushels in 1961-62.

Bean Variety Trials.—Four variety trials, in series, were conducted in Maitland district. In the early sown trial College Pride performed best. In the second trial College Pride, Brown Beauty and Redlands Greenleaf were best. In the third and fourth trials Windsor Longpod and Redlands Beauty were best.

In a trial of field beans at Glen Innes Agricultural Research Station, Great Northern and Corvette yielded well. Two selections made at Hawkesbury College from Small White x Granda also were very good.

A lima beans time-of-sowing trial was conducted at Glen Innes Agricultural Research Station. This season the sowing in last week of November gave best results. Henderson's Bush, Clark's Bush and L 128 yielded best.

PEAS

Breeding Programme.—The Hawkesbury Agricultural College programme to produce an early variety with superior canning quality and concentrated maturity was continued. Seed of 34 single selections and 32 lines of seven crossbreds were sown and compared with six commercial varieties including Cannors 75. The line Early Wonder x Cannors 75 v. one mechanical picking gave a 35 per cent higher yield than the male parent, but when hand picked four times the yield increase was only 12 per cent. Fifty-four new selections were made.

At Yanco Agricultural Research Station, eight breeding lines from the crosses Greenfeast x Massey, Greenfeast x Clucas Early Dwarf and Greenfeast x Wando were tested against L99 Hursthouse in a replicated trial. The most promising lines were a selection from the F_7 of Greenfeast x Massey and a selection from the F_7 of Greenfeast x Clucas Early Dwarf.

The Greenfeast x Massey selection was 13 days earlier than L99, gave 4,330 lb. shelled peas per acre, and had a tinned-quality scoring of 3.81 compared to 3.57 for L99. The Greenfeast x Clucas Early Dwarf selection matured 9 days earlier than L99 and yielded 5,808 lb. shelled peas per acre. The yield of L99 was 5,832 lb.

Canning Peas Rate-of-sowing Trial.—This trial was conducted at Yanco for the third year. It has compared seed spacings of $\frac{1}{2}$ in., 1 in., $1\frac{1}{2}$ in. and 2 in. The conclusion from three years is that the 1 in. spacing gives the highest yield of shelled peas per acre, highest yield of total green weight, and highest percentage of shelled peas recovered from the vines. It has also been found that close spacing slightly hastens the maturity of the peas. In the trial this year the 1 in. spacing gave a yield rate of 7,206 lb. shelled peas per acre, whilst the $1\frac{1}{2}$ in. spacing yielded at the rate of 6,887 lb. per acre.

ROCKMELONS

Breeding Programme.—The programme to produce new varieties resistant to *Fusarium* wilt and powdery mildew continued at Yanco Agricultural Research Station. This season all seedlings were inoculated with both diseases prior to transplantation. It enabled testing of a large number of plants, and allowed field agronomic selection to begin long before the natural outbreak of powdery mildew.

The most promising lines were seven selections from the F_3 of 36739 x P.M.R.45 x P.M.R.45. These gave fruit very similar to that of P.M.R. 45. Other good selections were made from the F_2 of P.M.R.5 x Spartan Rock, the F_2 of Delicious 51 x 34617, the F_2 of 34616 x Edisto and the F_2 of L.J.39781 x 36739.

Three of the lines were sown at Griffith in a commercially grown rockmelon crop. They were completely resistant to *Fusarium* wilt and showed marked resistance to powdery mildew, being only slightly affected towards the end of the season. A selection was made from the F_4 of P.M.R.45 x Spartan Rock.

Introduction.—The only introduction, Seminole from the U.S.A., was tested at Yanco and at Hawkesbury. It performed well, giving a good yield of attractive and nicely flavoured fruit. It showed good resistance to powdery mildew but was susceptible to *Fusarium*.

ONIONS

Breeding Programme.—The programme initiated in 1961 at Bathurst Experiment Farm was continued. The goal is production of a high yielding hybrid, with mid season maturity and good disease resistance. Twenty-eight crosses were made using the male sterile lines Cal Red and Excel A with commercial varieties and with some breeding lines from Victoria. Seed produced from crosses made in 1961-62 was sown this year. Best results came from Excel A x Early Grano, Excel A x Crystal Grano and Excel A x Early Barletta.

Variety Trial.—Fourteen commercial varieties were trialled at Yanco Agricultural Research Station. Most did well. For keeping quality, Imperial White Spanish was the best of the white onions whilst Pukekohe and Creamgold were best of the light-brown skinned types, and Australian Brown 102 and Australian Brown Cream Flesh were best of the dark-brown types.

CAULIFLOWERS

Breeding Programme.—Bathurst Experiment Farm continued the programme to develop early maturing high yielding disease resistant types. Numerous new crosses were made. In the F_3 generation, selections from Fricker's Original x Russian 2A, Selandia x Russian 2A and Fricker's Original x Idol were very promising. From the F_2 generations the best selections were from Russian 2A x Selandia and Fricker's Original x Compinas. Good selections from F_1 included Garant x Compinas and Brio x Russian 2A.

Introductions.—Of a number of recent introductions from Denmark tested at Hawkesbury Agricultural College the only one to show promise was Progress.

BRUSSEL SPROUTS

Improvement Programme.—A trial was conducted at Yetholme to compare present commercial varieties with lines produced in the improvement programme at Bathurst Experiment Farm. A selection from the F_2 of Fillbasket x Catskill produced a good even line of plants with a good yield of well-coloured firm sprouts.

CAPSICUMS

Improvement Programme.—From the 17 remaining lines of the Hungarian breeding material mentioned in last year's report, two have been selected at Hawkesbury College as the most outstanding. These are two to three weeks earlier maturing than the standard Californian Wonder types and give a heavier yield. They also have better resistance to bacterial soft rot and sun scald.

DIVISION OF HORTICULTURE

Research for the Fruit Industries

RESEARCH—CITRUS INDUSTRIES

Fruit Fly.—(a) *Sterilization of Oranges:* An experimental consignment of oranges fumigated with ethylene dibromide after waxing, wrapping and packing was shipped to New Zealand in October, 1962. The consignment comprised fruit from 32 orchards in the Murray River areas. The out-turn of the consignment was reported as being excellent, except for a rind disorder which developed in fruit from one orchard. The New Zealand authorities are satisfied with the efficacy of the fumigation treatment as a quarantine measure and have requested four further trial shipments during the current season to further assess any effects on the fruit. These four shipments will include cold-sterilized fruit to enable comparisons. The work is under the direction of the Technical Committee on Fruit Fly Sterilization Investigation in Citrus.

(b) *Sterilization of Lemons, Mandarins, and Grapefruit:* At the Citrus Wastage Research Laboratory, Gosford, ethylene dibromide fumigation treatment of lemons, mandarins and grapefruit to sterilize eggs and larvae of the Queensland fruit fly is now under investigation. To amass data of treatment effects on large numbers of fruit fly larvae, the fruits are artificially infested with eggs of the fly prior to fumigation. At completion of fumigation, the amount of gas taken up by the fruit and the mortality rate of the larvae are determined and the fruit is examined for any phyto toxic effect.

Stem Pit Virus Disease of Grapefruit.—The disease greatly reduces fruit size and causes misshapen fruit. It is caused by a virus readily transmitted by citrus aphids. In co-operation with Biology Branch, Division of Science Services, trials at Narara and Dareton Horticultural Research Stations are investigating whether protection against severe strains of the disease can be achieved by inoculation of the trees with a mild strain. Also, in a commercial grapefruit planting at Narromine where some trees are declining with severe stem pit, the apparently healthy trees have been inoculated with selected strains in an attempt to give protection against the severe form.

Controlled Dwarfing of Citrus Trees.—Control of tree size has been shown to be possible by inoculating selected "stunting" buds into Navel orange trees on trifoliata rootstock. The close planting of dwarf orange trees appears to offer certain advantages as a commercial proposition, e.g.: higher production per acre in the early years, more economical and effective spraying by use of mechanical drive-past equipment, and cheaper harvesting by eliminating ladder work.

If, over the long term, production per acre from close planted dwarf trees is comparable with that from normal size trees at orthodox spacing, costs of production would be substantially reduced.

A trial to explore possible commercial use of dwarf orange trees at close spacing has now been planted at Yanco Agricultural Research Station.

Breeding for Citrus Rootstocks.—As a result of a breeding programme done in the late 1940's, some selections have been made of material which may be useful as citrus rootstocks. The parents were trifoliata and blood oranges. The selected progeny are in screening tests to assess their resistance to various diseases: *Phytophthora* root-rot, Tristeza, etc.

More recently, hybridizations of trifoliata with Cleopatra and Scarlet mandarins have been done at Narara Horticultural Research Station.

Top-working Established Orange Trees.—Investigations of the reaction of various citrus scions worked on to established orange trees have continued. Generally, most sweet orange varieties, the Smooth Seville orange, the Wheeny grapefruit and mandarins appear satisfactory, although some mandarins are rather slow in their growth.

The bitter-sweet and the sour Seville oranges have not been satisfactory, nor have lemons with the exception of the Meyer.

RESEARCH—STONE FRUIT INDUSTRIES

Peach and Apricot Introductions.—Further introductions were made from interstate and overseas. They included canning peaches from South Africa, and dessert peaches and apricots from the U.S.A. Earlier introductions are at various stages of testing.

and some are still on provisional release from quarantine. New trials have been established at Yanco, Bathurst and Glen Innes, and they include several outstanding local peach varieties, among them the dessert types Glenalton and Fragar and the canning type Yanco Queen.

Peach and Apricot Breeding.—This programme at Yanco Agricultural Research Station has been intensified, and a detailed study of breeding lines has been made. Several promising types from earlier work are being further tested, including canning peaches Y55-2, Y55-16, Y57-13 and Y56-1 and apricots YA54-9 and YA55-5.

Chemical Thinning.—Rising labour costs have inspired intensive investigation of chemical thinning of stone fruits at Yanco Agricultural Research Station, Bathurst Experiment Farm, and on private orchards. Dicryl, N.P.A., 3.C.P. and D.N.B.P. were all unsatisfactory for peaches. D.N.B.P. showed considerable promise for plums when applied at the full-bloom stage to the Wilson variety.

Peach Pruning and Thinning.—Investigations at Yanco Agricultural Research Station demonstrated that the hanger system, by providing increased bearing area, gave greater yields. There was no difference between orthodox and long lateral pruning systems. Once again hand-thinning gave no significant yield increase.

Spray Irrigation Investigations.—These trials to provide data for development of horticultural farms in Coleambally Irrigation Area were commenced two years ago at Yanco Agricultural Research Station. Overhead and under-tree sprinklers have had no deleterious effect nor increased the pest or disease incidence in peaches, apricots, or prunes.

Furrow Irrigation Investigations.—Yanco Agricultural Research Station is testing the effect of irrigating Golden Queen peaches at three different frequencies, depending upon daily evaporation. The highest yields of canning size fruit were obtained from plots receiving an irrigation when the sum of daily evaporation was 3.75 inches. It was apparent early that more frequent irrigation, at 1.9 inches of evaporation, was beneficial to fruit size but problems developed because water infiltration into the soil decreased to a stage where trees suffered water deficits.

Rootstocks.—A large collection of rootstocks including five European plums, two red-leaf peaches and two nematode-resistant peaches will be tested as peach rootstocks as soon as they have been multiplied.

The Buck plum rootstock developed by the Department for European plums and d'Agen prunes appears to have a marked resistance to nematodes and waterlogging. It will be tested for use with Japanese plums and apricots.

STRAWBERRY RESEARCH

Strawberry Introductions.—New strawberry varieties from England and the U.S.A. were obtained from the Victorian Department of Agriculture. Of 16 new varieties tested, six have been selected as worthy of further trial. They include Talisman, Early Cambridge, and Massey.

Strawberry Breeding.—More promising types resulted from last year's work than from any previous year. The variety Kendall produced by the Department and released in 1961 was used as a parent on all the crosses. Twelve outstanding seedlings were retained for further testing.

Kendall itself is proving an excellent commercial and home garden variety in coastal districts. Demand for plants has exceeded supply. Some 50,000 to 60,000 Kendall plants have been included in commercial plantings in the past year.

RESEARCH—GRAPE INDUSTRIES

Zinc Foliar Sprays and Fruit Set—Gordo Blanco.—At Griffith marked increases in berry set and yields were obtained from experimental foliar sprays of zinc sulphate and lime applied to Gordo Blanco grapes four days before full-bloom. No response was obtained from applications made 10 days before full-bloom. Similar sprays of zinc chelate failed to give any improvement in fruit set.

Zinc Foliar Sprays and Fruit Set—Sultanas.—Four experiments in the Coomealla Settlement, in co-operation with the C.S.I.R.O., tested the effect of foliar sprays of zinc sulphate and lime, applied at full-bloom, on sultana yields. This followed yield increases in the order of 20 per cent in preliminary 1961-62 trials. Previous analyses had shown that the level of zinc in the vines chosen was low. However, in three of the experiments, zinc treatment depressed yields. In the other, yields from treated and untreated vines were the same.

Doradillo Decline.—An experiment commenced at Griffith in 1960 has indicated that widespread decline of Doradillo wine grapes in recent years is not associated with over-cropping. Yield from the lightest pruned treatment (16 x 2 bud-spurs plus 4 rods) was 15 per cent less than other treatments, even though the number of bunches carried per vine was 30 per cent more. Also vigour, as estimated by weight of prunings of the lightly pruned treatment, was 20 less than other treatments. Nevertheless, there was no symptom of severe decline.

An interesting observation was that in the cropping range of 16 x 1 bud spurs to 20 x 2 bud spurs, yields, bunch numbers, bunch weight and vigour were very similar in all four treatments. Indications are that greater growth and fruitfulness of adventitious shoots make up the balance in the more heavily pruned vines.

It was also shown that the fruitfulness of basal buds was about 10 per cent less than the first bud on the spur which, in turn, was more than 10 per cent less fruitful than the second bud.

Vine Mite Control.—An experiment at Coomealla in co-operation with Entomology Branch, Division of Science Services, tested various insecticides for mite control on Gordo Blanco grapes. Both Kelthane and the standard wettable sulphur sprays gave excellent control of bunch mite. They were equally effective. Ziram had no miticidal value.

Flaccidity of Purple Cornichon Table Grapes.—An experiment at Griffith indicated that the poorly coloured and soft berries in Purple Cornichon table grapes are not due to over-cropping as previously assumed. The condition is causing extensive losses in the Murrumbidgee Irrigation Areas.

Rootstock Trials for Table Grapes.—At Orchard Hills, eight *Phylloxera*-resistant rootstocks for Black Muscat table grapes are being tested. The 106.8 variety produced the largest crops over the last two seasons, averaging 13.9 lb. per vine. This was followed by vines on their own roots (12.4 lb. per vine) and the 101.14 variety (9.9 lb. per vine). The most popular rootstock in the district, du Lot, produced an average of only 5.0 lb. per vine. The best quality fruit has come from vines on their own roots, as well as 101.14 and 106.8 rootstocks.

Wine Grape Quality Investigations.—Continued assistance was given to the C.S.I.R.O. in a wine grape quality investigation aimed at defining factors responsible for the variation in quality of wine made from the same varieties of grapes grown in different districts. The investigation commenced in 1961. It involves analyses of leaf and fruit samples collected throughout the season from plots in the main wine districts of Australia.

New Table Grape Variety.—A new table grape, a late black variety from a cross between Ohanez and Purple Cornichon made at Yanco in 1937, was compared with Cornichon for storage and consumer acceptability in experiments this year. The analyses of results are not yet complete but indicate that it stores better than Cornichon. It is much better coloured, and equal in palatability. This grape, the first bred in Australia, has been named Nyora (meaning "native berry").

Grape Storage.—Ammonium carbonate and sodium orthophenylphenate were compared as fungicides, following earlier work which indicated their effectiveness.

Phylloxera-resistant Rootstocks Service.—Sales of *Phylloxera*-resistant grape rootstocks for the 1962 planting season were only 19,974, about half the 1961 total. The decline was due to a wet season, which prevented land preparation, and continued encroachment of urban areas into the grape-growing districts of the Counties of Cumberland and Camden.

The rootstocks are propagated at the Research Stations at Yanco and Narara. Their price has been increased from £25 to £30 per thousand.

RESEARCH—POME FRUIT INDUSTRIES

Mist Propagation of Cuttings.—Application of bottom heat improved the strike of Jonathan apple cuttings in mist propagation trials at Bathurst Experiment Farm, but the proportion developing roots (maximum 21 per cent) is still below commercial practicability. Two-inch cuttings were better than five-inch cuttings, and the application of I.B.A. improved the take of both.

Rootstock Trials.—A new rootstock trial of a range of Merton and Merton-Malling lines was planted at Bathurst Experiment Farm. In a similar trial established two years earlier at Glen Innes Agricultural Research Station there is evidence of differential vigour.

Apple Varieties.—The variety collection at Glen Innes Agricultural Research Station has been expanded to include GB12/13, GB28/18, GB4/9, Richard, Redbow, Batlow No. 2, Kidds Orange Red, Royden Red, Golden Delicious and Knights Seedling. The Starkrimson variety continues to show promise, and yields were four times greater than for Royal Red and Hi Early at Glen Innes.

Pears, Fruit Fly Sterilization.—At the Citrus Wastage Research Laboratory, Gosford, treatment of pears to sterilize eggs and larvae of Queensland Fruit Fly is under investigation. The process involves cold storage of the artificially infested fruit at 32°F. for periods of up to 10 days.

RESEARCH—TROPICAL FRUIT INDUSTRIES

Post-harvest Handling of Bananas.—At the request of the banana industry, post-harvest handling is now under investigation. Funds for employment of a research officer and to purchase essential capital equipment for the Tropical Fruit Research Station, Alstonville, were made available through the Banana Research Advisory Committee.

Weed Control in Bananas.—Pre-emergence treatments with chemical herbicides are giving good control in established bananas, but some damage to young plants has been noted.

Nematode Control in Bananas.—Overseas reports suggest control of nematodes by paring the planting material. A trial was commenced in November, 1962.

Pineapple, Type of Planting Material.—Phase one of this project ended in November, 1962. A close relationship was established between nature of planting material and yield. The work is being extended to include influence of plant density and flower induction procedures.

Pineapple Selection.—A selection programme based on material from Queensland and local growers has been established. Also, certain lines are being tested co-operatively with the Division of Food Preservation, C.S.I.R.O.

Macadamia Propagation.—Commercial propagation of Macadamia nuts has long been a problem adversely affecting development of the industry. Trials at the Tropical Fruit Research Station, Alstonville, have suggested some useful lines for further investigation.

FRUIT STORAGE INVESTIGATIONS

These investigations are carried out in co-operation with the C.S.I.R.O. Division of Food Preservation at Ryde.

Temperature and Humidity Effects in Storage of Pome and Other Fruits.—Much of the data obtained in 1962 storage season was analysed using the regression of transformed percentages of affected fruits on log storage period. Regressions differed in slope and were concurrent with the experimental range. Thus the effects of storage temperature depended upon the storage period at which the comparison was made. A similar study of low temperature breakdown gave regressions which differed in position but not in slope. Thus the regressions for the various temperatures were parallel. An extension of this method is being developed for pears, to include the effect of post-storage time as well as the period of storage. A paper in preparation will discuss this work more fully.

Diphenylamine Control of Superficial Scald.—A summary of the original work with diphenylamine was published in *The Agricultural Gazette of N.S.W.* Health authorities have not yet approved commercial treatment of apples and pears with diphenylamine.

Ethoxyquin Control of Superficial Scald.—Sufficient work to prove the usefulness of Ethoxyquin applied as a dip has now been done.

Polyethylene Bags for Fruit Storage.—These bags have now become an accepted commercial method for prolonging the life of Packhams and William pears. There is also commercial interest in their use with Jonathan apples, but until low temperature breakdown can be controlled they should be confined to small, hard grown fruit. Two papers on the results of the work to date are in course of preparation.

Further improvements in the use of polyethylene include use of a small amount of a carbon dioxide absorbent in the bag to reduce the level of carbon dioxide.

Tree Nutrition and Fruit Keeping-quality.—Pilot-scale experiments were used to determine the practicability of direct injection of minerals into the trunk of the tree. It was found that 1 lb. of urea could readily be injected during a growing season. Plans are now in hand to commence at Bathurst Experiment Farm a factorial experiment with the principal nutrients nitrogen, phosphorus, and potassium. A number of doses will be applied during the growing season and storage life of the fruit will be evaluated.

Storage Experimentation Methods.—In co-operation with a C.S.I.R.O. statistician, methods of carrying out fruit storage experiments have been improved. A preliminary report was published in *Nature*.

THE RESEARCH STATIONS, EXPERIMENT FARMS AND LABORATORIES

Viticultural Research Station, Griffith.—The first permanent experiments since tile drainage of the Station were planted in 1962. They are now well established. About 4 acres of wine grapes, comprising three pruning and training investigations, and 9 acres of peaches, citrus and grapes, comprising a major tile drainage experiment, are involved in the new plantings. Also, preparations to plant 5 acres of wine grapes during the 1963 winter have been completed. These plantings will incorporate an irrigation investigation and short-term experimental areas.

Eight wine grape varieties imported from France and Germany in 1959 and released from quarantine in 1962 will be established at the Station this winter. They will be propagated for subsequent yield and quality trials.

Cool Storage Laboratories, Ryde.—Co-operative investigations with the C.S.I.R.O. Division of Food Preservation are carried out at their laboratories at Ryde. Current work includes study of storage temperatures, controlled atmosphere storage and polythene bag storage in relation to physiological disorders of apples and pears. Study of superficial scald inhibitors has continued. Some new work is concerned with post-harvest problems of bananas, as part of the programme requested by the Banana Research Advisory Committee, and with relationship of apple tree nutrition and fruit quality.

Tropical Fruit Research Station, Alstonville.—Steady progress of the new institution has continued. A fruit research officer has been appointed. New plantings include 4 acres of bananas, 2 acres of pineapples and 2 acres of mangoes. A large packing shed was erected. The first Field Day was well attended.

Bathurst Experiment Farm.—Considerable reorganisation of the fruit research programme is in progress. Improved facilities, buildings and equipment have been provided. New plantings include a peach variety trial and an apple rootstock trial. Good progress continued in the writing up of the long-standing rootstock trials, and a number of articles have been published.

Agricultural Research Station, Yanco.—A new fruit-packing shed was provided, together with a fruit-sizing machine equipped with automatic fruit-weighing and fruit-counting devices. New trials planted include 270 trees of peach and apricot varieties and a detailed one to investigate dwarf orange trees.

Citrus Wastage Research Laboratory, Gosford.—Since 1949 portion of this laboratory was located in space leased from a local fruitgrower co-operative. Recently the co-operative has needed the space for its own activities and the lease has ended. Under the terms of agreement for co-operative operation of the Laboratory by this Department and the C.S.I.R.O. Division of Food Preservation, the C.S.I.R.O. has financed major extensions and renovations to the Laboratory's own building. Provision has been made for new washing, sterilising and waxing plant.

Horticultural Research Station, Narara.—A 300-gallon orchard spray cart with upper and rear platforms and three four-nozzle brooms was supplied, for effective rapid spray applications at the Somersby section. The office block has been renovated. A new high-level water tank was erected, and will permit better reticulation to the strawberry trial areas.

A new area of 1½ acres has been developed by clearing, construction of drains, fencing, etc., for a peach variety trial.



Development of the Horticultural Research Station, Narara

The aesthetic as well as the functional progress of this Station is in keeping with what is occurring at all other Departmental Farms and Stations. It also has an extension purpose.

Further strawberry variety trials have been planted in a newly-developed area. Excellent results were obtained from last year's trials. About 2,600 plants of twenty-three new introduced varieties are now in the trials, together with standard local varieties and twelve promising seedling selections from the breeding programme. Also, about 800 seedlings from last season's crosses have been planted out for observation.

Horticultural Research Station, Dareton.—Plans for an irrigation water escape channel and installation of a larger irrigation pump to cope with the Station's expanding needs have been finalised.

COMMITTEES AFFECTING RESEARCH

Banana Research Advisory Committee.—This Committee, established by the Standing Committee on Agriculture, held its first meeting in February, 1963. It is to advise on a research programme to investigate post-harvest handling problems of bananas and on the allocation of funds contributed equally by the banana industry and the Commonwealth Government. Funds were made available to this Department to employ a Fruit Research Officer and to purchase and install equipment at the Tropical Fruit Research Station, Alstonville.

Co-ordination of Research in Fruit and Vegetable Processing.—The Committee comprises representatives of the C.S.I.R.O. Division of Food Preservation and this Department, with two representatives of the canning industry. It co-ordinates research on fruit and vegetable processing in N.S.W., reviews progress and plans future work. Meetings are twice yearly. Matters under attention this year included citrus juice quality, breakdown of apricots, and sulphuring of dried fruits.

N.S.W. Canning Fruits Advisory Committee.—The committee is representative of canners and growers, with an officer of the Division of Horticulture as Chairman. Established at the request of the canning fruits industry, it reviews canning fruit plantings and makes recommendations to the industry.

Dried Fruit Processing Committee.—The Committee co-ordinates dried fruit research by the C.S.I.R.O. and State Departments of Agriculture of South Australia, Victoria and

Tasmania. Meetings are annual. Since 1929 the Committee has given valuable assistance to the dried fruits industry in Australia. It has been very actively associated with direction of research into the industry's major problems and has disseminated available information.

Deciduous Fruit Tree Improvement Committee.—The Committee, comprising officers of the Division of Horticulture and the Biology Branch, Division of Science Services, aims to prevent the spread of virus diseases in deciduous orchards and, in particular, to prevent propagation of infected trees. The Committee inspects sources of propagatory material for freedom from virus symptoms. Its programme covers about 90 per cent of the trees produced in N.S.W.

A collection of virus indexing plants has been established, and testing of commercial cherry varieties will commence next year.

Co-ordination of Fruit and Vegetable Storage Research.—This Committee, comprising representatives from all State Departments of Agriculture, the C.S.I.R.O., and the Department of Primary Industry, met at Brisbane to receive research reports and co-ordinate the investigational programme on storage and transport. The Committee is arranging a Conference of Fruit and Vegetable Storage investigators, to be held in N.S.W. in 1964.

A sub-committee, the Murray Citrus Sub-committee, held a Mildura meeting attended by representatives from South Australia, Victoria and N.S.W. Through the sub-committee, N.S.W. investigations are centred on fruit sterilization and fungicidal treatments, the Victorian work concerns cool storage, and the South Australians are on economic studies of fruit preparation and presentation for marketing.

Advisory Committee on Fruit Cool Storage Investigations in N.S.W.—Representatives of the C.S.I.R.O. Division of Food Preservation, the Botany Department of the University of Sydney, and this Division attended a meeting of this Committee. It is concerned with physiological, biochemical and chemical aspects of fruit storage. The occurrence of scald in cool-stored apples is one of the major interests.

Citrus Wastage Research Committee.—This, a sub-committee of the Advisory Committee on Fruit Cool Storage Investigations in N.S.W., met twice this year to direct the investigations of the Citrus Wastage Research Laboratory at Gosford operated jointly with the C.S.I.R.O. Division of Food Preservation. The work under the Committee's control concerns wastage during harvesting, handling, storage and marketing of citrus fruits.

Fruit Fly Sterilization Investigations in Citrus.—This Technical Committee, comprising representatives of the Department of Primary Industry, the C.S.I.R.O. and the State Departments of Agriculture in Victoria, South Australia and New South Wales, met twice this year. It has been directing the fumigation treatment to sterilize fruit fly eggs and larvae in oranges and is currently involved in arranging four trial shipments of fumigated oranges to New Zealand.

Fruit Fly Commodity Treatment Committee.—This newly constituted Committee comprising similar representation to the Technical Committee mentioned above, with also a representative from Queensland. It met twice this year, to initiate investigations on the fumigation treatment of lemons, grapefruit and mandarins and the cold sterilization treatment of pears.

Citrus Improvement Committee.—This intra-Departmental Committee met twice to review and plan work concerned with the affects of virus infection, soil-borne root pathogens and toxins on citrus behaviour and productivity.

Extension Activities for Fruit Industries

Range of Services.—The demand for services of extension officers continued to increase. All extension aids have been employed in coping with it, including radio, television, press, field days, special classes, lectures and group discussions as well as orchard visits. Television has come to two rural centres and field officers there have been quick to exploit its potential. Television offers tremendous scope for horticultural extension purposes and its use will be developed.

Divisional Conference and In-service Schools.—A full Divisional Conference was held at Hawkesbury Agricultural College during May, 1963. This was the first such full conference, with every category of officer present, since 1947. It provided opportunity for complete orientation of Divisional policies concerning research, extension and regulatory functions, as well as detailed discussion of practical problems in all fields.

Officers of the Division also attended in-service Schools on (a) Farm Management, and (b) Extension Methods.

The Division was represented at and submitted papers for the Australian Agricultural Extension Conference held at Hawkesbury Agricultural College in August, 1962.

Staff Vacancies.—The Divisional extension staff is still four short of full establishment, and three districts remain to be filled when officers in training become available.

Packing and Presentation of Fruit.—Concern regarding the general standards of quality and presentation of fruits on New South Wales markets has prompted a serious effort to create a general uplift through the Division's extension services. Results so far have been encouraging.

The Fruit Packing Instructor, assisted by Divisional officers in the markets and in the field, has conducted thirty-one organised packing demonstrations and made many visits to individual growers. Three organised apple packing classes were conducted at Orange, Batlow and Bathurst. From these some 240 proficient apple packers graduated for immediate relief of a serious shortage of skilled packers in those districts, and to set efficiency standards for those areas. This project has received excellent co-operation from local industry and is capable of expansion during 1963-64.

Liaison between market and field officers has been improved to enable more effective grading and packing guidance to growers. Growers' organisations and selling organisations have been co-opted for active participation in the campaign, and this has yielded better mutual understanding and co-operation.

Planting Statistics Published.—New South Wales fruit planting statistics have been collated and presented in book form for the industry and allied interests. The data have been very useful to Divisional officers in advising on planting prospects and crop estimates.

Bud Selection.—A valuable service has been provided through the Division's Deciduous Fruit Tree Improvement Committee. About 90 per cent of all stone fruits are now being produced from sources inspected and approved by this Division. The Citrus Bud Selection Committee has continued to have similar good effect.

Pest and Disease Control.—This demanded and received major attention by field staff. Spray calendars have been prepared and distributed, specific to each major fruit growing area. Special services for warnings of pest and disease incidence and control action were also maintained in all districts. These services include incidence-recording devices in the field and prompt warnings through local radio and press channels.

Comparative, spraying demonstrations planned and supervised by the Orange District fruit officer include practically all currently used types of spray units and have held tremendous interest amongst the fruitgrowers.

Red Scale control received constant attention in all inland citrus districts. The results have been satisfactory. Levels of infestation have been gratifyingly low in the past season in all orchards that followed the recommended procedures.

Citrus Gall Wasp was reported in Gosford district for the first time. A detailed survey immediately defined the area of infestation and infested trees were destroyed. Press, radio and television publicity were added to the campaign. Attention was also directed to nurseries and the vicinities of nurseries in the near Metropolitan area to prevent infestation of nursery trees.

Orchard Management.—Extension officers have become more closely involved in farm management services to the grower. This area of service is bound to increase as an effect of the activities of Regional Economics Research Officers, Division of Marketing and Agricultural Economics. The Division of Horticulture is now giving close attention to development of an acceptable system of Orchard Management Records for use in this regard.

Citrus Fruit Quality.—Sustained extension activity on fertilizer practices aimed at improved citrus fruit quality in the Murrumbidgee Irrigation Area commenced ten years ago. Results are now apparent in much higher quality oranges. Less nitrogen and more phosphate in fertilizer programmes has been the prime trend.

Citrus Fruit Processing for Market.—Processes involving washing, mould sterilising, rinsing, drying and waxing as recommended by the Citrus Wastage Research Committee are now generally accepted as essential to efficient marketing of fresh citrus fruits. But it has been necessary to maintain an intense extension service to prevent packing house managements falling into error in operation, and so failing to attain the desired benefits of clean, mould-free, non-shrivelled fruit.

Fruit Industry Trends

AWARENESS OF ROLE IN NATIONAL ECONOMY

The fruitgrowing industry generally has awakened to the fact that it is an important section of the national economy. A recent survey has shown that the gross value of production is of the order of £117 million, some 30 per cent of the production value of all crops and about 10 per cent of the value of exports of all primary industries including wool and other livestock products. With near to 126,000 acres devoted to fruitgrowing, New South Wales has a major role. Sectional fruit industry organisation are now increasingly interested in industry matters.

CITRUS INDUSTRY TRENDS

Production.—Crops in all districts were again heavy. This strained the local markets which normally absorb 80 per cent. The Navel crop sold reasonably well. The dry winter helped keeping-qualities and the crop was moved successfully. This was not the case with Valencia. These were abundant and in coastal districts, where small fruit was common, the spring and early summer clearance was delayed. Greater quantities than usual had to be marketed in the late summer and early autumn. Rainfall from December onwards was adequate for Valencia sizing in the high rainfall districts.

Comparative absence of granulation in the coastal late-held Valencias helped market placement of the greater part of the crop. In late-held Valencias from the Mid-Murray districts of Barham and Barooga losses due to granulation were substantial.

Mould wastage flared in coastal grown fruit after abnormal rains in March and April, 1963. Heavy losses were sustained by some growers. Their losses would have been much greater but for the Sodium ortho-phenylphenate (SOPP) dip-rinse treatment now used by packing houses on recommendation from the Citrus Wastage Research Laboratory.

Export.—The large orange crop stimulated interest in export. Industry representatives visited Far-Eastern countries with a view to selling citrus, whilst the European and Canadian markets were not overlooked. As a result the export quantity of citrus greatly increased.

Handling, Presentation and Marketing.—A marked improvement in quality grading and market presentation of citrus sent to the Sydney market by New South Wales growers has been a feature of the 1962-63 season.

In the past, oranges from the Lower Murray districts of New South Wales, Victoria and South Australia have received premium prices on the Sydney market, but this competition has now been met with fruit from the Murrumbidgee Irrigation Areas, Narromine, and even from coastal districts, showing better selection and processing and packed in clean attractive containers. Prices received for this fruit have equalled and, on occasion, surpassed those paid for South Australian fruit.

Because of less demand for low grade fruit, the industry has given increased attention to improved presentation, involving higher standards of quality, storing, washing, mould sterilizing, and waxing, and, for premium quality, brand-stamping individual fruits.

The industry, concerned with the high cost of marketing, has widely adopted bulk handling from orchard to packing shed as an economy measure.

Direct selling to distributors and retailers is also finding increased favour as a means of avoiding market charges and so reducing cost to the grower.

Processing for juice and other citrus products has developed substantially. It is approaching the status of an important permanent part of citrus marketing. This is supported by the total of 695,600 bushels of oranges and lemons absorbed by processors in the past year, as in the following tabulation:—

	From Coastal Districts	From Inland Districts	Total
Valencia oranges	5,500 tons (258,500 bushels)	1,800 tons (84,600 bushels)	7,300 tons (343,100 bushels)
Lemons	7,200 tons (338,400 bushels)	300 tons (14,100 bushels)	7,500 tons (352,500 bushels)

Thus, about 10 per cent of the Valencia orange crop and 80 per cent of the lemon crop was directed to processors. Processors paid premiums for fruit with special qualities, and this marked an important departure from the earlier practice of only low grade fruit to factories.

Rootstocks.—Marked preference for orange trees on *P. trifoliata* rootstock for new and replacement planting has been maintained, especially in the districts most seriously hurt by the root-rot fungus *Phytophthora* sp. after the series of wet seasons from 1949-50. This trend is illustrated by figures for the M.I. Areas. There, up to 1951, 50 per cent of Valentias and 30 per cent of the Navels were on trifoliata. Plantings since 1956 show 95 per cent of Valentias and 89 per cent of Navels are on trifoliata.

New Plantings.—The tempo of planting has eased considerably, as new Murray irrigation settlements have completed the planting phase. Cudgel and Coleambally near Narrandera are still planting, but the farms involved are too few to affect the issue.

WINE AND WINE GRAPES INDUSTRY TRENDS

Production.—Wine grape production in N.S.W. for the 1963 vintage is estimated at a record 34,000 tons, compared with 33,538 tons in 1962.

Production in the M.I.A. remained high at 30,784 tons, as against 31,318 tons in 1961-62, and compared more than favourably with the 20,134 tons average for the previous five years. The total of introductions of wine grapes from the Murray districts into the M.I.A. for processing fell considerably from 4,896 tons in 1962 to 1,861 tons in 1963.

Continued high production in the M.I.A. was in part due to excellent weather and in part to the accrued effect of underground tile drains in many plantings.

Production in the Hunter Valley is expected to exceed 1,400 tons, as against 1,089 tons in 1962 when hailstorms and ripe-rots reduced the vintage.

Estimated N.S.W. 1963 wine production is 6,344,000 gallons, a little less than in 1962 (6,861,892 gallons). Less grapes were brought in from Victoria for processing.

Wine Grape Prices.—Generally the prices paid for wine grapes in the M.I.A. remained at the previous year's level. The combination of good prices and high yields for two consecutive seasons has been a relief for growers, following low returns in the greater part of the previous decade. Substantial wine grape plantings are expected in the M.I.A. this winter.

Interest in Quality Varieties.—With the growing demand for table wines, the industry is striving to raise quality standards. Much has been achieved through improved wine-making techniques, especially in the irrigation districts. Further improvements are being sought by the planting of certain quality varieties even though many are poor croppers. Most emphasis has been placed on the high quality but low yielding claret grape Cabernet Sauvignon, and experimental wine made in the M.I.A. indicates its great promise.

TABLE GRAPES INDUSTRY TRENDS

Production.—N.S.W. table grapes production is estimated at 5,500 tons, compared with 5,917 tons in 1961-62. The coastal districts had poor weather conditions and, apart from substantial losses, quality was low. In addition, poor quality of the main M.I.A. variety Purple Cornichon forced growers to divert large quantities to wineries.

In the M.I.A. table grapes production fell from 294,515 half-bushel cases in 1961-62 to 200,306 half-bushel cases in 1962-63. Poor colour and the flaccidness of Cornichon is an increasingly serious problem in the district.

The tablelands had a good season, as did the Murray districts which sent large quantities of sultanas to the Sydney markets.

Table Grape Prices.—Prices for M.I.A. fruit were less than normal, due to the lower quality. They averaged 12s. to 16s. per half-bushel case.

Decline in Plantings.—The area of table grapes is expected to decline significantly in near Metropolitan districts, mainly due to urban spread. Replantings are mainly on inferior clay soils. These will not produce large crops. N.S.W. table grapes production has increased by 50 per cent in five years by increased diversion of drying varieties but there will be marked shortage of early black grapes soon.

DRYING GRAPES INDUSTRY

Production.—N.S.W. 1962-63 dried vine fruits production is estimated at 9,500 tons, compared with the 13,499 tons record in 1961-62. Hot, dry conditions in November interfered with fruit setting. The remainder of the season was good and the fruit was high in sugar. Excellent drying weather ensured a high quality pack.

Prices.—Prices for dried vine fruits have fallen. Expected return for the 1962 crop is £95 per ton. In May, 1963, 20 per cent of the crop remained to be sold. Delivery payments for the 1963 crop were reduced despite the good quality, and returns of less than £95 per ton have been forecast. Returns in the previous five years averaged between £100 and £125 per ton. The slow rate of payments for 1963 fruit is causing some financial difficulties.

New Plantings.—Australian dried vine fruit is expected to meet increasing competition on overseas markets, but the planting rate of drying varieties exceeds normal replacements. All development is taking place in private irrigation schemes. In N.S.W. last year 480,000 rootlings of drying varieties were propagated, sufficient to plant 1,000 acres. Although many of these were sold in Victoria the total indicates the optimism within the industry for the future.

POME FRUIT INDUSTRY TRENDS

Planting Statistics.—Pome fruit plantings continued to increase steadily throughout the State. The latest tree census taken by the Division of Horticulture shows the total N.S.W. acreage to be 20,586, comprising 17,457 acres of apples and 3,129 of pears. It represents 1,440 acres more than when the previous census was taken in 1961.

The increase is solely apples. Actually pears have declined by 18 acres. Of the total area, 5,176 acres of apples and 542 of pears are young trees under ten years of age. Almost all of these are in the districts best suited to these fruits by reason of climate and soil. Planting of new areas is continuing but at a declining rate.

Production and Markets.—The crop was just on 3,000,000 cases of apples and 530,000 cases of pears, about a 100 per cent increase on what was an average State crop up to the mid-1950's.

The year by year increase has naturally influenced market prices downwards. Returns are still fairly satisfactory but it has become clear that low-grade fruit or second-rate varieties are not worth presenting. With a probable million case increase in the next few years, this position will be accentuated. Thus a decline in acreage is expected in the lesser favoured areas or even in some of the better areas where the small farmer and less efficient farmer may be unable to carry on under the high production and marketing costs.

Export.—This year N.S.W. exported 216,000 cases of apples and 14,500 cases of pears. This was considerably more than usual, but still only a small proportion of the total crop and not enough for much impact on local prices.

The prospects of substantial increase in the N.S.W. export quota are not bright. Production has increased considerably in all States, as in the competitor countries South Africa, New Zealand and Argentina.

Varieties.—Fortunately only about 13 per cent of the N.S.W. plantings are varieties other than the ever-popular Granny Smith, Delicious and Jonathan. This 13 per cent comprises mainly early varieties that have a place in the first two months of the calendar year, and such other varieties as Democrat, Crofton and Rome Beauty with a place as late cool storage reds.

The only notable varietal trends at present are the tendency to plant red "sports" of Delicious and Jonathan and the decline of Democrat acreage. Democrat is slowly being superseded as the premier long-storage red by Crofton and a new seedling variety "Bonser".

Increased Cool Storage.—Cool storage facilities continue to increase, particularly in the main production centres and mainly by grower installations. N.S.W. storage facilities are now sufficient for half the total crop. This permits marketing over the full twelve months. In the three main districts alone, space for about 400,000 cases has been added since the 1961 census.

Increased Bulk Handling.—A large part of the crop in the main producing areas is now handled in bulk. Each year sees a few more growers changing to this system. It has special value in the later districts, where most of the crop is cool stored. The best and most elaborate installations are in these districts. Savings in cost of handling, apart from less fruit damaged, make bulk handling imperative for all large areas.

Plantings.—The previously reported trend towards planting in hedge rows on semi-dwarfing stocks is gaining ground. An appreciable acreage is now planted on this system in the main districts.

Cultural Trends.—"Less pruning and more fruit thinning" and "less cultivation and more fertilizing" sum up the cultural operations trends and account for much of the rapid increase in production.

STONE FRUIT INDUSTRY TRENDS

Production.—Volume and quality of production were high. There were record crops of canning peaches and apricots, cherries (at Young), and prunes. Most dessert peach, nectarine and plum crops were above average. The sudden great increase in canning peach production in the M.I.A. embarrassed the growers and canners, particularly in the Griffith area. Fruit generally inclined to be small but of good quality.

Canning Peach Production Increasing.—The big increase in production is likely to continue as more young trees reach maturity and improved production methods take effect. A movement to establish a cannery at Griffith to handle increased production has received sufficient assurances of finance and fruit supplies to start preparations.

Improved Demand for Apricots.—An upward trend in fresh apricot production has been maintained and is likely to continue. Processing of apricots into paste has helped to relieve anxiety regarding canned fruit.

Heavy Cherry Plantings at Young.—Spectacular expansion is continuing at Young, but there is little interest in other districts. About 180 acres were planted at Young last year. It was one of the largest increases ever, despite poor prices for cherries in the previous year. At Young there is confidence in the industry and expansion will continue. At the same time there is room for better cultural attention in many of the new as well as older plantings.

Increasing Interest in Prunes.—Both in the M.I.A. and at Young, prune growers are giving increased attention to the crop because of attractive returns. In each area there is some increase in plantings. Favourable seasons, better pruning, fertilizing and other cultural practices have led to heavier production, and the poly-cell pack for marketing high moisture fruit has boosted local sales.

Plum Plantings Increase.—Most districts report increasing interest in plums. There have been slight increases in plantings in recent years, particularly on the coast. The increase is about to gain impetus.

New Peach Varieties.—All districts are intensely interested in the new varieties of dessert and canning peaches recently introduced from overseas. Some of these will be much better than existing commercial varieties. Small plantings of the earlier introductions which have shown promise are being made, mostly on the coast and in central tablelands districts.

Trend to Direct Sales.—Selling direct to the consumer is a continuing trend. Some growers are very successfully disposing most of their crop in this way. The consumer response is good.

BANANA INDUSTRY TRENDS

Banana Acreage.—The N.S.W. acreage is now 27,276, including 1,138 acres planted in 1962-63. In the same period 2,387 acres were destroyed, so the total declined by 1,249 acres. Replacement of Cavendish by the Williams variety continues. Williams is now 86 per cent of the total.

Production and Prices.—Production for 1962-63 was much the same as for last year. The trend is a decrease in acreage and number of growers, whilst production remains fairly constant at about 4,000,000 cases. The season was good and production was very high in November and February. At these periods prices were low and many growers did not market all of their fruit. For the rest of the year prices were fair. The steady per acre increase in production due to better cultural practices and apparent for some years past is expected to offset the decline in acreage. On the other hand, for seven or eight years there has been a run of good seasons. An adverse season could reduce production.

Marketing.—Growers are taking more interest in presentation. Cardboard cartons, cluster and hand packs, and the overall better presentation are receiving more attention. A change-over from the 1½ bushel case to a 1 bushel container has been made.

Regulatory Services

DISTRICT AND SUBURBAN INSPECTIONS

Fruit Fly.—Town treatment schemes commenced in 1960-61 were continued. Results have been excellent. Other western and south-western towns have shown their interest and approached the Division of Horticulture for technical advice.

The Euston inspection point has been maintained in conjunction with the Victoria Department of Agriculture. About £30,000 has been spent on this work since its inception in October, 1960. Although 544,315 vehicles have been inspected only 31,106 vehicles carried fruits and only 26 infestations were confirmed as fruit fly.

The Wentworth inspection point was discontinued when inspection of 26,887 vehicles had failed to detect fruit fly and by consideration of the incidence of fruit fly in the areas most affected by inspections at Wentworth.

Citrus Gall Wasp.—Systematic inspections of all known nurseries and re-sellers of citrus trees have been completed. Metropolitan inspections continued along the same lines as in previous years. All possible action has been taken to control the outbreak of this pest in the Gosford district, and the County of Cumberland has now been gazetted a Quarantine Area for the purpose of Regulation No. 53 under the Plant Diseases Act and the prescribed treatment for Citrus Gall Wasp.

Potato Inspections.—Inspectors under the Plant Diseases Act continued to provide the inspection and sealing of certified potato seed and to inspect potatoes in the field and at all recognised markets within N.S.W.

The need for potato growers to obtain the requisite Potato Growers License has been publicised and checks on licenses have been made in all districts.

Bunchy Top in Bananas.—This disease remains confined to areas north of the Richmond River, and strict control over movement of banana planting material has reduced infestations to an insignificant figure.

Banana Beetle Borer.—Banana growers in the districts concerned have contributed a levy of one penny per case of bananas, to provide finance for beetle borer control. The work is proceeding satisfactorily.

Movement of Fruit into Murrumbidgee Irrigation Areas.—Applications have increased for introduction of fruit for processing within the Murrumbidgee Irrigation Areas. Their effect upon the quarantine policy is under close observation and the Inspectors continue to implement quarantine regulations under the Irrigation Act and the Plant Diseases Act.

Citrus Maturity Tests.—This service has been provided in all citrus areas as a guide to citrus growers. Close watch has been maintained at the city markets to ensure that fruits for sale comply with the Citrus Grading Regulations.

Grape Maturity Tests.—1,550 cases of grapes were withheld from sale because of immaturity. Early grapes are a very perishable product and the need to provide an efficient testing service without undue detention from sales is a matter of some concern. To expedite the testing the Chamber of Fruit and Vegetable Industries offered temporary use of their accommodation and facilities. This was an advantage.

Vine Nematodes.—To prevent nematode spread and limit the damage, all vines propagated in nurseries in Murray River districts were inspected before sale. Some 480,000 rootlings were propagated. All vines found infested were rejected from sale unless heat-treated under the supervision of Inspectors under the Plant Diseases Act.

Prosecutions and Warnings.—Fifty-eight prosecutions were initiated under the Plant Diseases Act and 237 warning letters were addressed to first offenders. Most of the offences were breaches of grading regulations and/or failure to carry out prescribed measures for fruit fly and codlin moth control.

Review of Inspectional Boundaries.—The duties of Inspectors, Plant Diseases Act, and re-alignment of inspectional boundaries have been reviewed to provide the most effective regulatory services consistent with economy, staff establishment and changes caused by suburban and horticultural development.

Major changes so far effected have been the amalgamation of Maitland and Newcastle inspectorates and resultant transfer of an inspector to Gosford where increased orchard plantings and incidence of Citrus Gall Wasp support the need for three inspectorates instead of two. Suburban development and decline of orchard plantings in County of Cumberland have permitted variations in inspectorates within this area.

CITY MARKETS AND INTERSTATE SUPPLY INSPECTIONS

Essential services have been maintained, but staff shortages of up to 25 per cent of the Export and Import Branch establishment and the need to give priority to quarantine work reduced market inspections to the minimum. Notwithstanding staff shortages, support was given to the Divisional programme of improving market presentation. Effort was concentrated to ensure proper branding of packages, particularly for tomatoes. The influx of small Mediterranean growers has made difficult the enforcement of gazetted regulations.

Apples.—Heavy supplies of 1961-62 fruits continued until late December, by which time quality had greatly deteriorated. Most 1962-63 fruits have been of good quality and condition, although some of the earlier supplies were small and somewhat immature. Two Tasmanian consignments were stopped because of Red Mite but Tasmanian fruits as a whole have been well graded and in good condition.

Pears.—These came from Victoria and N.S.W. districts. The N.S.W. fruit was much superior in keeping qualities. The Victorian pears have shown signs of breakdown after several days in the market and have also been inferior in grade.

Oranges.—Valencias from the central coast and Hills districts were in heavy supply throughout the season and of good keeping quality. Few Navels were marketed before attaining maturity standard. Black Spot, Melanose, Sooty Mould and Silver Scurf caused about 30 per cent of these oranges to be classified as "Plain" grade. Some of the consignments from the Murrumbidgee Irrigation Areas were badly blemished by dead Red Scale. Fruits from the Murray Valley districts were generally of very good quality.

Mandarins.—Small fruit from coastal 'Hills areas have been blemished by Melanose, Sooty Mould and Silver Scurf, and marketed as "Plain" grade. There were good supplies of medium to large fruit from Queensland: mainly "Special" and "Standard" grades.

Lemons.—Most of the supplies were from coastal 'Hills areas and, affected by Scab, marketed as "Plain" grade. Meyer lemons from Queensland were in good supply and much cleaner than local lemons.

Grapefruit.—Light supplies were received from all areas. They were well graded and mainly of "Standard" grade.

Peaches.—There were heavy supplies from all districts except the Murrumbidgee Irrigation Areas. They were of good quality and showed little incidence of Brown Rot.

Nectarines.—Very light supplies of nectarines were received. The fruit was small and of poor quality but with little incidence of Brown Rot.

Apricots.—Medium supplies came from local districts and the Murrumbidgee Irrigation Areas, and from Victoria.

Cherries.—Supplies were heavy early in the season, but rain lowered the quality of the main crop.

Grapes.—Quality was excellent but some growers, particularly Queensland growers, commenced harvesting too early and 1,550 cases were withheld from sale because of immaturity.

Bananas.—Summer supply was heavy and fruit was of good quality. As usual, supply became lighter towards the end of summer. The advent of new cartons and improved presentation encouraged the demand for clusters.

Pineapples.—Good quality medium to large size fruit was supplied throughout the season with little incidence of Blister.

Strawberries.—Heavy supplies from Queensland were followed by berries from local sources, then Tasmania and New Zealand.

Potatoes.—Potato inspections were at Perry Park, Alexandria goods yards and City Markets. About 3,000 sacks were downgraded and reconditioned due to Moth and to mechanical injury.

IMPORT INSPECTIONS

Plants and plant products from overseas were examined for the Commonwealth Department of Health in accordance with the provisions of the Quarantine Act.

Seeds.—Importations of pasture seed, grasses and clovers, totalled 30,033 sacks. This was an increase of 8,720 sacks over the previous year. The bulk of it was Ryegrass and Clover seed from New Zealand. A total of 809 sacks was fumigated for insect infestation. Other consignments were re-cleaned to remove prohibited seeds. Totals of 66,399 lb. of flower seeds and 97,186 lb. of vegetable seeds were imported. Flower seeds increased by 46,031 lb. and vegetable seeds decreased by 68,339 lb.

Nursery Stock.—Nursery stock importations were similar in quantity to those of 1961-62. The following quantities of plants were held under the Nursery Stock Regulations:—Orchids—6,133, Ornamental plants—823, Bulbs and rhizomes—8,234, Rose budding eyes—2,641, Lily of the Valley pips—20,000.

There were insects in some consignments and the plants were fumigated. In other consignments plant diseases were found, and these plants were destroyed or sent back to the country of origin.

Parcels Post.—All parcels containing plants or any form of plant material arriving from overseas at Parcels Post were examined. A total of 9,474 parcels was examined and 1,833 parcels were detained for further examination. The contents usually were plants, bulbs, seeds, peanuts, popcorn, and raw cotton samples.

Cases and Packages.—At Overseas wharves, cases and packages containing general merchandise were inspected daily, for detection of Sirex wasp and other wood-boring insects. Borer infestation was found in 81 wooden skids, 228 wooden cases. Eighty-nine bundles were found to be wrapped in straw wraps and bamboo, 952 bales had bamboo slats in the packing, 212 casks had bamboo binding and 292 baskets were made of bamboo. All of these cases, casks, bales and baskets were fumigated, heat-treated or burnt, under supervision.

Dunnage.—Considerable dunnage was placed on the wharves from overseas ships. Dunnage fumigated under supervision totalled 223,000 super. feet.

Passengers' Baggage.—A total of 223 passenger ships was met for examination of items brought to notice by Customs. The quantity of prohibited and infested goods concerned included fruit, plants, seeds and wooden cases.

Timber.—Over 100,000,000 of the 194,948,000 super. feet inspected was from North America. Most of the infested material requiring quarantine treatment came from Malaya.

General.—902 ships carrying goods subject to quarantine inspection entered the port of Sydney. Inspection revealed a wide range of infestation. The appropriate actions taken included fumigation, heat treatment, processing under supervision, and destruction by burning. Forty-one different types of plant material, including dates, copra, bamboo products, nuts, spices and seeds required quarantine treatment. Special reference is made to several consignments of garlic despatched from Mexico and found to be infected with *Helminthosporium alii* (bulb canker).

Nine hundred and thirty-three imported motor vehicles were passed after initial inspection, but 615 others were found to be contaminated with soil and were cleansed before release.

EXPORT INSPECTION

Fresh fruits, seed, rice, wheat and flour submitted for export were inspected on behalf of the Commonwealth Department of Primary Industry under the provisions of the Commerce (Trade Descriptions) Act.

Citrus Fruits.—A total of 15,938 bushel cases of Navel oranges was passed for export and only thirteen cases were rejected. The fruit was from the Murrumbidgee Irrigation Areas and Gosford districts and mainly consigned to Pacific and Asian ports, but 1,285 cases were despatched to Bahrain.

Trial consignments of "pulled" Valencia oranges, precooled for fourteen days at 31° +1 were included in shipments to Asia. The total of 85,576 bushel cases shipped included consignments to England, in addition to New Guinea, Pacific Islands, Bahrain and Canada.

There were large shipments of lemons to Singapore, Hamburg and Liverpool; a total of 7,618 cases as against only 298 in the previous year. Quality was good and all fruits were passed for export.

All of the 1,517 cases of grapefruit submitted for export were consigned to Asian ports, and 1,427 of the total were for Singapore.

Pome Fruits.—The 1961-62 total of 135,419 bushel cases of apples was exceeded this year, when 204,466 cases and 11,386 cartons left from Sydney. Some 7,859 cases were rejected on the wharf for reasons such as Bitter Pit, Bitter Rot, Black Spot, excessive bruising, broken skins, over-maturity, spray residue and San Jose scale.

Only 14,380 bushel cases of pears were shipped, and 876 cases were rejected. Most of the pears were from the M.I.A. or Orange.

Seed.—Large quantities of seed, mainly for pastures, were exported. They were in the main consigned to the U.S.A., New Zealand and Japan.

Rice.—Some 41,194 tons of rice were exported, 4,235 tons less than in 1961-62. The rice went to New Zealand, New Guinea (21,493 tons), Pacific Islands (8,198 tons), Hong Kong, United Kingdom (6,380 tons), Okinawa.

Flour.—The 188,526 short tons of flour exported, 3,783 less than in 1961-62, went to Colombo (44,236 tons), South Vietnam (4,500 tons), the remainder to United Kingdom, Borneo, Malaya and Pacific Islands. The rejections, mainly for flour beetles or wet bags, were 5,016 x 150 lb. sacks.

Wheat.—New grain export regulations have been gazetted, and the Commonwealth Department of Primary Industry has requested the Department of Agriculture to provide the inspections. Temporary services had been provided for the last two years, but implementation of the new regulations will require some staff adjustments.

Some 825,899 tons of wheat involving 68 ships were inspected in 1962-63, and 5,864 tons were rejected.

The inspection service was initiated to facilitate sales of wheat to Red China but has increased the demand from other countries. This is supported by the following details of shipments:—

No. of Vessels	Destination	Tonnage Loaded	Tonnage Rejected
54	China	691,060	4,108
4	India	54,684	164
3	Japan	18,488	310
2	United Kingdom	29,920	Nil
2	New Zealand	9,648	Nil
1	East Africa	9,570	1,210
1	Chile	9,364	Nil
1	Beirut	2,965	72

DIVISION OF DAIRYING

General

Summary of Activities.—Activities comprised administration of Acts (mainly the Dairy Industry Act) and Regulations, herd production improvement work, extension services and research affecting dairying industry efficiency, and maintenance of dairy products standards.

The Production Year.—Seasonal conditions ranged from almost drought conditions in the Riverina in autumn to flood and overwet conditions in the whole of the coastal area from April to June. Production of milk and manufactured dairy products were less than in the previous year, because seasonal conditions ranged from periods of near-drought in the Riverina to destructive coastal floods.

Figures for the principal dairy products in 1962-63 are compared with the 1961-62 figures in the following tabulation:—

	1961-62	1962-63
Milk	342,826,000 gal.	325,869,000 gal.
Butter ...	87,346,358 lb.	80,428,739 lb.
Cheese ...	13,335,558 lb.	11,881,344 lb.

Overseas Visit by Chief of Division.—The Divisional Chief attended the XVI International Dairy Congress, in Copenhagen, 3rd to 7th September, 1962. He also visited several other countries, and observed practices and developments likely to benefit the dairying industry in Australia. His report and recommendations will be printed for distribution to the industry.

Officer Seconded to Australian Dairy Produce Board to Help Establish S.E. Asian Markets.—A dairy officer has been seconded to the Australian Dairy Produce Board for two years in the Philippines, to help establish a plant and train South East Asians for milk reconstitution and laboratory tests. The long-term Commonwealth aim is establishment of new markets for Australian dairy produce.

Dairy Industry Trends

Butter.—Re-organisation of manufacturing plants by installation of stainless steel churns is almost complete. Only a few wooden churns are now in operation.

Cheese.—Almost all cheddar cheese produced in N.S.W. is the film-wrapped rindless variety. A small market for cloth cheese may always exist. Imports of fancy or so-called continental cheese have increased. Concerted efforts are being made by Dairy Division officers to encourage manufacture of these varieties locally.

Cheddar cheese mechanisation plant has been installed in two large factories and has reduced manufacturing costs.

Casein.—The casein market has not been attractive and has been minimised. There is no move in New South Wales towards new plant installation.

Milk Powder.—An export market in milk crystal powder has been obtained by Consolidated Milk Industries (at Grafton) in conjunction with a U.S.A. firm.

Skim milk powder from N.S.W. is being used in increasing quantities in milk reconstitution plants in the Philippines. Quality control is exercised by Dairy Division officers as part of their normal extension duties.

Ice Cream.—Two large N.S.W. ice cream manufacturers have entered the Brisbane market, providing a considerable further outlet for N.S.W. surplus milk supplies.

Legislation Amendment

Dairy Industry Act—Margarine.—Special legislation was passed under the Dairy Industry Act and is described in more detail in the "Legal and Registration Branch" section of this Report.

The legislation requires the keeping of specified books to ensure that manufacture of table margarine will not exceed the quantities allocated to licence holders. The total of table margarine that may be manufactured annually was fixed earlier at 9,000 tons. The amended Act has not varied this total.

Regulatory Services

DAIRY INDUSTRY ACT, 1915-60

Advisory Committee.—The Dairy Produce Factory Advisory Committee approved two applications for registration of premises as dairy produce factories and six applications for registration of a dairy produce store.

Appeal Board.—The Appeal Board constituted under Section 2 to deal with appeals against decisions of Inspectors under the Act, had no occasion to meet. All registered factories under the Dairy Industry Act complied satisfactorily with suggestions for improvement and any remedial orders. Some additions were made to various factories. These included a new butter room and cold room at Kyogle, and greater cold storage space at a number of cheese factories because of plentiful supplies.

Competency Certificates for Dairy Factory Operatives.—Six decentralised Dairy Science Schools were held for tuition and examination of 83 candidates for qualifications under the Act. Also, many factories were visited by examining officers to conduct examinations not covered by the schools. Results:

Examination—	Certificates Issued
Cheese making	7
Butter making	6
Milk Grading	45
Milk Testing	37
Cream Testing	49
Cream Grading	21

The number of examination applicants indicated that interest in qualifying for the various certificates is being maintained in the industry. Where special classes were held by dairy officers the results were satisfactory.

Butter

Manufacture and Grading.—The butter grading staff regularly examined butter and cheese manufactured by N.S.W. factories and received at Sydney, Newcastle, Wollongong and Canberra for distribution and storage prior to sale on the local market. Samples from Wollongong and Canberra were sent to Sydney for grading. Officers regularly visited Newcastle, and butter manufactured at Casino Co-operative Dairy Company also was examined at that centre, prior to local cold storing.

Information gained from these gradings was in each case supplied to the factory managers and District dairy officers, to help overcome any noted quality or other manufacturing faults.

Considerable butter was imported into New South Wales from other States late in autumn and in winter and early spring, to supplement local production. At the request of the selling agents the quality was checked by Departmental graders prior to distribution.

Quantities Examined and Graded.—The number of boxes of interstate and intrastate butter examined by N.S.W. graders totalled 1,463,729, compared with 1,505,417 in 1961-62, and 4,755 grade certificates were issued.

Services through Shows and Competitions.—The grading officers were used as Judges and Stewards in the Dairy Produce Sections of the Sydney Royal Show, the Newcastle Agricultural and Horticultural Society Show, North Coast Agricultural and Horticultural Society Show, Lismore, and Coffs Harbour Show; and at competitions held in conjunction with the N.S.W. Division of the Australian Institute of Dairy Factory Managers and Secretaries.

Moisture and Salt Analyses.—Butters manufactured at N.S.W. factories were analysed for moisture and salt content. The results were forwarded to District dairy officers.

Biological and Chemical Examinations.—Samples were regularly forwarded to Division of Science Services for biological examination. The results were forwarded to factory managers and District dairy officers.

Special investigations in regard to butter quality defects were conducted at various N.S.W. factories. The Biology and Chemistry Branches of Division of Science Services co-operated with Division of Dairying in these matters.

Retail Butter Surveys.—These were conducted in the Sydney metropolitan area and country districts, to determine the quality of butters reaching the consumer. The surveys were followed by discussions with distributors, to check relevant faults.

Order of Merit (Butter) Certificate Scheme.—To be eligible for consideration for this certificate of the Department of Agriculture a factory must submit for grading during a season the undermentioned percentages of its butter manufacture which has been branded as "choicest" quality:—

	Per cent
March-April	25
October-December	45
January-February	65
Seven months period (overall) covering those specified above	65

Those seven months specified, extending from 1st March of one year to 28th February of the next are regarded as constituting a season.

To qualify for an Order of Merit Certificate a factory, besides complying with the aforementioned requirements, must market, true to "choicest" brand, at least 92 per cent of its "choicest" branded butter examined by butter graders of this Department and the Commonwealth Department of Primary Industry. The results for 1962-63 are in the following paragraph, as a comparison with the preceding four years.

Percentage of Butter Marketed as "Choicest."—This was 94.2 per cent, compared to 91.7 per cent in 1961-62. Seventeen factories were awarded Merit Certificates.

The comparative figures for five years including 1962-63 are:—

1958-59	87.1 per cent—9 certificates issued
1959-60	90.8 per cent—11 certificates issued
1960-61	89.0 per cent—12 certificates issued
1961-62	91.7 per cent—14 certificates issued
1962-63	94.2 per cent—17 certificates issued

Cheese

Quality.—This has improved over the year. It is in particular attributable to factories' interest in submitting for grading a sample from each vat. Three factories now submit a mark from each vat for grading, and a further three factories are likely to participate in this system in the coming year.

Despite accumulation of stocks in other States, and thereby increased competition on the N.S.W. market, factories that are maintaining fair quality are not finding it very difficult to dispose of their cheese. Factories that have not installed suitable starter equipment are in the main those that are finding disposal of their produce difficult. In some of the cases, poor third-grade cheese has been submitted for grading.

Seven special investigations on cheese quality were made, with the co-operation of Biology Branch, Division of Science Services.

Starters.—Starter problems were met in a number of cases. Where approved equipment was subsequently installed the difficulties were largely overcome. Six factories have not yet installed approved starter equipment.

Incidence of Non-Clotting Milk.—The South Coast and Tablelands Agricultural Region Advisory Committee drew attention to the incidence of non-clotting milk deliveries to cheese factories. Bega and Nowra district samples were tested. The limited work so far done has confirmed the incidences. Further work will be done.

Production Trends.—Favourable seasonal conditions prevailed for the fifth year in succession on the south coast. In consequence, three factories have expanded by adding three more vats. Near to record production of cheese occurred in New South Wales.

About 75 per cent of the cheese produced was in film wrap. Most factories are presenting cheese for retail sale in consumer-sized $\frac{1}{2}$ lb and $2\frac{1}{2}$ lb. packs.

There are at present twenty-one factories registered under the Dairy Industry Act for cheese manufacture, and two more proposed factories whose application has been approved by the Minister provided constructional needs are met within twelve months.

Export Trends.—A number of south coast factories became interested in the export of cheese both in waxed 80 lb. and rindless 40 lb. sizes. It called for co-operation between this Division and the Commonwealth Department of Primary Industry, and the Rindless Cheese Committee of the Australian Dairy Produce Board.

To date no large consignment of rindless cheese has been exported, but there have been small consignments of 80 lb. rounds. One large south coast factory has installed a Bellsiro Cheesemaker No. 3 and reconstructed the factory to permit the installation. Two of these units are now operating in N.S.W.

Processed Cheeses.—Production of processed cheeses continued to expand. There are now three factories engaged in it.

The range of varieties other than cheddar has increased again. The additions are Ricotta, Mozzarella and Gouda.

Interest in manufacture of Cottage Cheese, creamed and uncream, is continuing. The sales are increasing slowly. Yoghurt, sour cream and cultured buttermilk manufacture are also increasing.

FACTORIES AND SHOPS ACT

As Departmental officers are authorised as inspectors under this Act to supervise safety measures within the dairy industry, all necessary steps were taken during the year to ensure conformity with these regulations. This work is done in conjunction with normal duties and does not necessitate special visits.

Dairy Industry Research

Funds and Organisation.—The research work of the Division continues to be supported in part by funds from the Australian Dairy Produce Board. These funds finance the work at Hawkesbury Agricultural College of the Dairy Research Officer on quality of detergents and components.

Financed from State funds are a Special Dairy Research Officer seconded to the New South Wales Milk Board, a Dairy Research Officer (Milking Machines) at Hawkesbury Agricultural College and a Dairy Research Officer at Head Office. A Dairy Chemist of the Division of Science Services is also stationed at the College, for research into butter manufacture.

Milking Machine Efficiency Survey.—The results of this Survey continue to provide statistical information of value to research officers as well as extension workers.

A second Milking Machine Summer School and Conference was held in Melbourne in February, 1963. Four officers of this Division attended.

Standards of Equipment Performance.—The Department is represented in the Technical Sub-Committee of the Dairy Husbandry Research Foundation and in the D.S.—6 Committee of the Standards Association of Australia. The Department has undertaken to act as the testing authority on behalf of these organisations, and the needed facilities are being developed at Hawkesbury Agricultural College.

Air Flow Meter testing has been undertaken there for several years. Demand for the testing of detergents and components is likely to increase.

Milk Quality Research.—The Special Research Officer on secondment to the Milk Board has worked on problems of oxidised and light-induced flavours of market milk, and on methods of determination of milk composition.

The "bitterness of cheese" project in conjunction with the School of Dairy Technology at Hawkesbury Agricultural College, has been continued.

Reports on various research projects will be found under the "Dairy Research" heading in the Hawkesbury Agricultural College Section of this Report of the Department.

Herd Production Improvement Work

Herd Recording, Organisation and Methods Surveys.—Organisation and methods surveys were done in respect of clerical work in the Official Herd Recording and Group Herd Recording Schemes. A concurrent survey was done in the Biometrician's Section which participates in this clerical work. The recommendations from these surveys led to appointment of an additional office assistant in the Division of Dairying, and reduction in the machine-operating staff of the Biometrician's Section. These developments relate also to Public Service Board installation of Automatic Data Processing equipment (next paragraph).

Effect of Automatic Data Processing Equipment.—The Public Service Board has installed a Honeywell 400 High Speed Computer, likely to be in operation by September, 1963. One of its first applications will be to utilise its high speed printer, and its facility to read Hollerith cards, to produce the current Annual Herd Summaries for the Group and the Official Herds, Annual District Summaries and the *Registered Pure Bred Cattle in New South Wales* publication.

Following that, the system of data preparation of the Herd Production Improvement Scheme will be revised to assure maximum use of the Honeywell computer. The Dairy Division's statistician is working on this project with two officers of the Public Service Board's A.D.P. Division.

The bull proving scheme, designed by the Division's statistician as an adaptation to local conditions of the method employed by the Milk Marketing Board of Great Britain, also will be included in that second phase. One of the goals is production of published matter acceptable to breeders and the artificial breeding centres.

The Herd Recording Schemes.—The prime goal of herd recording is to enable members to obtain reliable information on which to base a programme of herd improvement to increase the efficiency of production. This year, further expansion occurred.

In the *Official Herd Recording Scheme* the number of herds being recorded has increased from 230 to 240 and the number of cows being recorded has increased from 10,000 to 10,630. In the *Group Herd Recording Scheme* the herds have increased from 1,335 to 1,352 and the cows from 61,000 to 61,500.

Herd Recording staff has not increased, due to funds, but the waiting list of prospective members for Recording Groups has greatly increased.

Calf Marking Scheme.—This year 12,105 heifer calves were marked under the Scheme, bringing to 99,349 the total calves so far marked. Of the total calves marked, 1,643 were bred by artificial insemination and 30 were merit calves.

Certified Bull Scheme.—This year 422 certified bull certificates were issued.

"Solids-Not-Fat" Recording.—The two "Solids-Not Fat" units conducted under the Commonwealth Dairy Industry Extension Grant continued to operate. Over 4,000 cow lactations have been recorded under it. These records are now being processed to determine within the limits of the available data the various factors involved in Solids-Not-Fat production.

Sire Survey Scheme.—In this Scheme 123 bulls were surveyed. The data received represent only a fraction of the material available for survey. A wider survey cannot be undertaken at present.

Due to the deficiency of daughter numbers in herds using natural breeding methods, the number of bulls with sufficient daughters to qualify for a rating is necessarily very low. Those in use at artificial breeding centres qualify much sooner.

In consequence, the weighting or authority of surveys of sires used in natural breeding is rarely sufficient to determine the bull's genetic worth during his lifetime. The worth of bulls used artificially is generally known well before their useful life is finished, ensuring maximum use of the best genetic material.

Of the 123 bulls surveyed: 51 reduced the production of their progeny and 72 improved it. The worth of the thousands of bulls not surveyed is an unknown but vital statistic in the dairy industry. It highlights the need for expansion of artificial breeding, because this *inter alia* enables unsatisfactory bulls to be more quickly eliminated.

Bull Proving Programme.—The Department is co-operating in the New South Wales Milk Board's Bull Proving Programme; and the Division of Dairying is represented in the Bull Proving Committee and in the Bull Purchasing Committee. The Milk Board buys considerable numbers of young bulls, 1 to 2 years old, for "proving" as quickly as possible. To implement this Scheme the Board co-opts the help of members of the Herd Recording Scheme, to make available for insemination with semen from these young bulls a number of cows in each co-operator's herd. Thus, the bulls will be "proved" in a number of herds. It will ensure more authentic "proof". The first progeny from these matings are now arriving. Within three years there should be valuable evidence of the worth of each bull involved.

Departmental Dairy Herds

The old established Ayrshire Stud at Bathurst was dispersed. The need for expansion of the city of Bathurst into the area occupied by the Bathurst Experiment Farm has prompted reduction in the Farm's activities. This Ayrshire Stud was established near the end of last century and has been under continuous Herd Recording for the past 45 years. Dispersal was faced with deep regret.

The remaining Departmental dairy herds continued. There was demand for top lines beyond the Department's capacity to supply, including the Polled Jersey herd at Grafton Experiment Farm.

The Polled Jersey herd at Grafton Experiment Farm is the only one in Australia. Its production is slightly below that of the other Departmental herds but understandably so because the breeding stock must be selected first for polledness in order to fix this factor as quickly as possible. In order to build a solid foundation of production and breed type, as well as polledness, regular infusions of top quality horned animals are added to the Stud. The horns are then "bred off" their progeny by matings to polled members. There are now 41 poll females and 2 poll bulls, and the bulls are genetically pure for this factor. A third bull is being repurchased, having proved his pure polledness in another herd following his sale as a calf.

The popularity of this stud is increasing. Several farmers are now dehorning their herds with polled bulls from the Grafton Stud.

The Friesian herd at Hawkesbury Agricultural College gained the honour of "most successful exhibitor" at the Royal Show for the second year in succession. Both the Jersey and the Guernsey herds were major prize winners.

The top cow of the Wagga College team of Jerseys was one of five selected by a committee of leading breeders to represent the Jersey breed. This team went on to win the John Darling inter-breed competition for type and production.

A Friesian heifer from Hawkesbury College topped the dairy cattle sales. It was purchased by a West Australian breeder aiming to blend her special genetic material with that of his own herd.

In addition to the award of "Top Jersey of the Year", individual Departmental cows gained honours of "Class Leaders". Four Jerseys, two Guernseys and one Ayrshire occupied these positions.

The Guernsey herd also won the William Newcombe cup for the fourth year in succession. This prize is for the herd that has the six highest Guernsey records.

Production of the Departmental herds is very satisfactory. This is shown by the records of the Official Herd Recording Scheme and the Breed Societies Annual Production Competitions.

Extension Services

Dairy Science Schools.—Six Dairy Science Schools were conducted, for tuition and examination of factory operatives for certificates of competency in milk and cream testing and cream grading. Eighty-three operatives attended the Schools.

Milk and Cream Graders' Refresher Course.—The 1961-62 Refresher Course in Buttermaking and Testing was the first of its kind for dairy produce factory operatives. This year

a Refresher Course for operatives in Milk and Cream Grading was held at Hawkesbury Agricultural College. Twenty graders attended, from many parts of the State.

Visits re Milk and Cream Quality.—Officers spent 5,920 hours in Dairy Produce Factories check-grading milk and cream and the manufacture of other dairy products. Two hundred and seventy-eight visits were made in connection with check-grading milk and 559 for cream. In part as a result of these checks, 4,229 farms were visited to advise farmers on how to overcome the defects. One hundred and fifty-one special investigations were made on farms for milk and cream defects and 293 special investigations were made in Dairy Produce factories.

Development of Bulk Milk Collection.—Officers attended a Bulk Milk Conference in Melbourne to discuss latest developments in bulk-milk collection and to see a display of all farm bulk-milk tanks and factory bulk-milk tankers.

There has been some development of bulk-milk farm tanks in N.S.W. during the year. The most outstanding development was in the Deniliquin area. The Hunter Valley and Taree districts have bulk-milk collection areas operating satisfactorily.

Statistics of Farm Visits.—Approximately four and a half thousand farms were visited by dairy officers for general extension work. In addition, 70 visits were made in connection with Dairy Industry Extension Grant demonstrations on farms, and 1,152 were made for herd improvement instruction.

Dairy officers travelled by car 159,455 miles in the course of the year's work.

Statistics of Mass and Group Media Activities.—Dairy officers attended for extension purposes 180 field days, 43 film evenings, 74 meetings of Agricultural Bureau Branches, and 35 Agricultural Shows. The Show work included the Judge and Steward duties in the Dairy Cattle and Dairy Produce Sections of the Sydney Royal Show.

Approximately 150 radio talks were given by dairy officers.

DIVISION OF ANIMAL INDUSTRY

General

VETERINARY DIAGNOSTIC SERVICES, GLENFIELD

Totals of Specimens Examined for Diagnosis.—These increased to 45,760 compared to 38,336 in 1961-62 and 30,534 in 1960-61. The 1962-63 total comprised 16,313 from cattle, 13,362 from sheep, 5,983 from poultry, 9,201 from pigs (compared to 4,993 from pigs in 1961-62 and 1,226 from pigs in 1960-61), 135 from horses, 539 from miscellaneous animals, and 227 miscellaneous other specimens.

Entries in the Specimen Register totalled 6,498, compared to 6,358 in 1961-62 and 5,109 in 1960-61.

Inspections under the Noxious Microbes Act totalled 34, comparable with 32 in 1961-62 and 33 in 1960-61.

Of the 9,201 specimens from pigs, 7,857 were in respect of swine fever, and 1,096 in respect of brucellosis. Of the 13,362 specimens from sheep, 9,282 were relative to brucellosis, whilst 1,581 were for worms and 1,233 for Q fever. Of the 16,313 specimens from cattle, 5,603 were relative to brucellosis, 1,909 for worms, 2,893 relative to pleuro pneumonia and 1,292 to Q fever.

Toxicology Specimens.—Specimens were received from 197 sources and involved 421 analyses: arsenic, 224; lead, 85; phosphorus, 12; oxalate, 17; and miscellaneous, 83 analyses.

Arsenic caused 35 mortalities in which 106 cattle, 131 sheep, two horses, six pigs and four fowls died.

Lead poisoning caused nine mortalities and the death of 14 head of cattle. Lead arsenate used as an anthelmintic drench was the probable cause of death of 16 sheep. Analyses showed that absorption of lead was slight, but arsenic content of the liver was 7.1 ppm calculated as arsenious oxide.

Examination of decomposed aluminium phosphide (phosphoricide) residue from a haystack revealed that it contained a substance not decomposed by moisture but able to evolve phosphine when treated with dilute acid.

A large lump of white granular material suspected of having poisoned cattle was found to be composed almost entirely of sodium silicofluoride.

Concerning sodium monofluoro-acetate (1080) poisoning: Following reports that citrate concentrations are increased in the tissues of animals poisoned with fluoro-acetates, a series of experiments was carried out in mice and sheep, to determine whether this effect could be the basis of a suitable laboratory method. Further observations will be necessary to assess the reliability of this method.

RABBIT MYXOMATOSIS

Level of Demand for Myxoma Virus.—Disregarding that 92,000 rabbit doses of myxoma were made available to Victorian authorities in 1961-62, the distribution of virus from Glenfield has remained much the same over the last four years, viz., between 37,000 and 48,000 doses. In 1962-63 the actual number of requests was slightly less than in the previous year.

Virus Despatches over 13 years.—The number of requests and amount of virus distributed from Glenfield since 1961 have been as follows:—

Year	Doses	Ampoules	Requests
1962-63	48,750	1,950	295
1961-62	135,325*	3,633	460
1960-61	37,300	1,492	288
1959-60	39,000	1,560	181
1958-59	126,625	4,997	653
1957-58	152,425	6,097	661
1956-57	200,200	7,763	742
1955-56	194,200	3,884	542
1954-55	280,850	5,617	673
1953-54	296,900	4,514	558
1952-53	279,200	3,389	.....
1951-52	249,600	.....	.....
1951 Feb. to June	21,600	.....	.....

* Includes 92,000 doses sent interstate, notably to Victoria where a major release of the N.S.W. strain of virus was organised.

Higher Viability of N.S.W. Strain.—To ascertain why the N.S.W. strain of virus is more virulent and probably more infective than the Standard strain, the Glenfield Station has co-operated with Dr. Sobey of the C.S.I.R.O. Genetics Section by providing him with samples of Glenfield virus at various stages of its progress through about 70 rabbit passages over the last 12 years. So far, all samples examined have proved viable. This indicates the satisfactory techniques of preparation and long-term storage at Glenfield.

ARTIFICIAL INSEMINATION WORK

Test-mating of Bulls for Artificial Insemination Centres.—Of 21 bulls undergoing tests for evidence of bovine venereal infections, 20 had been provisionally selected for the N.S.W. Milk Board Artificial Insemination Centres at Berry (Graham Park) and Aberdeen. Of these, 13 went to one or other of those Centres during the year and two more are expected to do so early in 1963-64. The remaining five were rejected owing to evidence of vibriosis. One of these was returned to the owner on request, and the other four were consigned for slaughter with the owners' concurrence. Those rejected were three Friesian and two Australian Illawarra Shorthorn bulls, including one from Queensland.

Nine of the 21 bulls were on hand before 1st July, 1962; twelve arrived during the year; and three had not completed their tests by 30th June, 1963. Of nine sent to Berry, three were A.I.S., including one each from South Australia and Queensland, two were Friesians, including one from Hawkesbury Agricultural College, and there were one each of the Jersey, Guernsey, Ayrshire and Beef Shorthorn breeds. The Guernsey was from Wollongbar Agricultural Research Station.

Aberdeen Centre received an Aberdeen-Angus bull from Hawkesbury Agricultural College (bred at Trangie Agricultural Research Station), an Ayrshire from Bathurst Experiment Farm and two Jerseys.

The three bulls still under test at the end of the year included a Jersey returning to Wagga Agricultural College after having been in service elsewhere.

Training of Inseminators.—A number of schools of instruction were held during the year in collaboration with the N.S.W. Milk Board. Assistance to the practical training was provided by provision of slaughtered animals at the Riverstone Meatworks. Certificates of Competency were finally issued to 15 of the 16 candidates.

MISCELLANEOUS DISEASE INCIDENCE NOTES

Bloat.—Seasonal conditions produced a prolific growth of clover in much of the State during the spring, and this was responsible for a high incidence of bloat. The condition was particularly serious on many beef raising properties where improved pastures have been laid down and the holdings are not sufficiently subdivided to permit pastures being sprayed with oil emulsion. Many such owners sustained heavy losses.

Muzzle Disease in Cattle.—A syndrome believed to be that described as muzzle disease in the United States by Hollister *et al* (1956) and Schiedy *et al* (1956) was encountered in cattle in 10 herds. Morbidity was low. There was no mortality.

Heliotrope Poisoning of Sheep.—Widespread heavy losses in sheep occurred in the Riverina from ingestion of *Heliotropium Europeum* prevalent in the area. Conditions during the preceding summer had favoured the growth of this plant.

Following advice from the C.S.I.R.O. that cobalt bullets may prevent poisoning with heliotrope, many owners treated their sheep in this way. Beneficial effects, if there, will only be apparent at a later period.

Encephalomalacia in Sheep.—An outbreak of polio-encephalomalacia characterised by necrosis of the cerebral cortex occurred in a flock of sheep on the northern tablelands; 16 merino wethers were lost from a group of 530, and the mortality was 100 per cent of affected animals. This is the first record of the disease in New South Wales.

The condition encountered is believed identical with that described in New Zealand by Hartley and Kater (1959) and in the United Kingdom by Terlecki and Markson (1961) and Spence *et al* (1961).

Focal symmetrical encephalomalacia was also diagnosed for the first time in this State. It was on two properties on the central tablelands. Losses were light, and involved lambs.

Enterotoxaemia in Sheep and Cattle.—Increased incidence in cattle was encountered. In many instances diagnosis could not be confirmed due to difficulty of demonstrating enterotoxin. It is believed that many losses in beef cattle previously attributed to bloat have in fact been due to this disease.

At Leeton Agricultural Research Station cases of enterotoxaemia were encountered in cattle which had been vaccinated against the condition.

Seasonal conditions favoured the disease in sheep and there were widespread outbreaks in spring and early summer. On one holding 600 of 7,000 lambs were lost.

Many of the outbreaks in sheep were associated with heavy infestations with *Moniezia expansa*. Evidence was found of heavy tapeworm infestations leading to reverse peristalsis. Contents of the colon were found well forward in the small intestine.

Oedema Disease of Swine.—Overseas countries tend to regard this as a disease affecting only weaners. This age group in New South Wales is certainly that most commonly affected but oedema disease has been seen also in pigs a few days' old and in mature adults. Stress, and particularly a nutritional stress, has nearly always been associated with incidence of the disease.

Overseas methods for positive diagnosis of oedema disease were applied at the Glenfield Veterinary Research Station to specimens from pig mortalities. A considerable proportion of the mortalities investigated by field officers was found to be caused by it.

Diagnosis was made on clinical grounds; from a consideration of the history, symptoms and post mortem appearances, particularly the development of oedema in internal organs when haemolytic coliforms were isolated from the small bowel soon after death, or from mesenteric lymph nodes sampled on post mortem examination.

Research for Animal Industries

SHEEP INDUSTRY RESEARCH, VETERINARY STATION, GLENFIELD

Veterinary

Carbon Tetrachloride Poisoning.—A. Two heavy mortalities have been recorded in sheep drenched with carbon tetrachloride while grazing on flowering stinkwort (*Inula graneatensis*). In one of these mortalities, the sheep were also being fed lopped kurrajong (*Sterculia diversifolia*) without

flowers or seed pods. To determine whether either of these plants potentiate the toxic effects of carbon tetrachloride, two series of feeding experiments were carried out at Glenfield with similar material from one of the affected properties. Biochemical studies showed clearly that stinkwort significantly increased the toxic effects of carbon tetrachloride on the liver. Kurrajong did not have this effect in these trials.

B. Following observation that mortalities in the field, after dosing with carbon tetrachloride, were often associated with a significant concentration of oxalate in kidney tissue, the effect of intravenous infusions of sodium oxalate on kidney function was studied in experiments. A clear cut and specific effect on kidney function was demonstrated. The experiments also suggested that oxalate probably exerts its effect not by a direct toxic action on kidney cells but by blockage of individual nephrons, probably with calcium oxalate crystals, leading to progressive kidney failure.

Muscular Dystrophy.—Following supplementation trials with selenium and Vitamin E in affected areas, methods to determine Vitamin E and selenium levels in plant and animal tissues have been studied.

In exacting and complicated work on methods of analysis for vitamin E in animal tissues a promising stage has now been reached. It involves using frozen specimens, vacuum drying, and then a complex process incorporating column and two-dimensional paper chromatography, before final spectrophotometric determination. The technique for plant analysis is also at an advanced stage.

The experience gained may have a major influence on future analytical procedures, as the method may be adapted to separate and quantitatively determine substances for which previous techniques have been unsatisfactory.

Methods for selenium estimation are being examined.

Contagious Pustular Dermatitis.—Occasional field evidence suggests that vaccination of lambs for "scabby mouth" has not efficiently protected some sheep against a subsequent outbreak of the disease. A suggestion is that as vaccination is frequently undertaken on lambs at marking time, and the lambs might vary in age from a few days to seven weeks when a single marking programme is adopted, the younger lambs may not be adequately protected by vaccination. A trial was therefore arranged at Leeton Agricultural Research Station in co-operation with officers of the McGarvie Smith Institute, the Leeton Station and the Narrandera District Veterinary Officer.

Lambs were initially vaccinated in age groups of 0-4 days, three weeks and six weeks and subsequently challenged with a group of non-vaccinated control lambs at three months, six months and 12 months post vaccination. Although naturally acquired infection prior to the second and third challenge periods interfered with the interpretation of results, there was evidence that lambs of all ages could be effectively protected by vaccination.

Helminth Parasites in re Ill-thrift in Sheep.—Trials have been conducted in co-operation with veterinary field officers to determine the part played by helminth parasites in interfering with both body and wool growth.

In one series, commenced last year, thiabendazole was dosed monthly to young prime lambs and their growth rate was compared each month with those in an untreated group. The effect of the same treatment on wool growth was determined on another five country properties, over twelve months. All sheep in these trials were weighed and treated monthly and faecal samples were examined at Glenfield.

The lamb growth trials ended when the animals averaged 70 lb. live weight. Although results were in some cases complicated by liver fluke, all but one treated group showed a gain over the control groups. The highest was 5.2 lb.

In the wool growth trials, treated groups showed differences in fleece weights of 0, +0.79, +1.63, +1.05 and -0.15 lb. compared with those from the untreated groups. There was little difference in quality. The results also may have been complicated by liver fluke in some of the sheep.

Anthelmintic Trials.—Trials at Glenfield, and in the country in co-operation with veterinary officers, aimed to determine the efficiency of certain anthelmintics. Sheep with mixed worm infections were obtained and groups of treated and untreated sheep were subsequently slaughtered and whole worm counts were made. In other trials worm-free lambs were dosed with infective larvae and treated at various intervals before slaughter, so that the effects on immature forms could be determined.

Preliminary investigations of the following anthelmintics have been completed:—Ultramised phenothiazine against *Haemonchus* and *Trichostrongylus* in both immature and adult stages; Bayer S.940—against mixed infections and against *Oesophogostomum*; thiabendazole—by peritoneal injections; "Phenovis 2" (PTZ and phenidole)—against *Haemonchus* and *Trichostrongylus*—all stages, and against mixed infections; phenidole—against mixed infections; bithional—against liver fluke; piperazine complex—against mixed infections; linter (yomeson)—against tapeworms in lambs; R.D. 11 798 (Boots)—against tapeworms in lambs; and horehound extract—against mixed infections.

Anthelmintics Incorporated in a Lick.—The practicability of controlling worms parasites by low level continuous dosing with anthelmintics incorporated in a block molasses lick remained under study. Groups of 50 sheep are being used in a trial at Shannon Vale. Currently it appears that while parasites may be controlled with small daily dosings there are some difficulties associated with administration in the field. The work involves monthly weighings and examinations of faecal samples from all groups. As well as the field work, the effect of small daily doses of anthelmintics is being studied on sheep at Glenfield Station.

Anthelmintic Toxicity.—A number of anthelmintics are being tested for toxicity at various dose rates: viz., Bayer S.940, haloxon, ultramised phenothiazine, freon, phenovis 2, thiabendazole and carbon tetrachloride. The use of santogin with carbon tetrachloride to reduce toxicity is also being field tested.

Lice Control.—Insecticide trials for control of body lice are being carried out, using the new plunge and shower dips and the tip sprayer. Tests were made at different concentrations and with sheep with wool of various lengths. The following insecticides are being examined:—diazinon, nankor (in three different formulations), vetamax (Nicholas), rotenone, lime sulphur, and lime sulphur combined with diazinon.

Six months' protection against re-infestation with lice was obtained with diazinon at 0.01 per cent.

Itch Mite Trials.—Studies with parasites were continued using diazinon, nankor, rotenone and sodium arsenate. In some of the trials the infestation died out in the untreated controls. This work will be repeated.

Blow Fly Insecticides.—Field trials with nankor indicated control for eight weeks but flies in the untreated controls were not active enough for conclusive results. Tests using the bio-assay method with this chemical were also inconclusive.

Larvae of *Lucilia cuprina* implanted three and four months after dipping in diazinon at 0.01 per cent failed to survive, indicating length of protection period.

Ovine Brucellosis.—Activities have been largely confined by heavy commitments to diagnostic complement fixation tests, and use of this technique to support investigations into field aspects of the disease, mainly directed towards assessment of eradication procedures.

Encouraging improved methods of antigen production have been achieved, with large volume broth cultures producing high antigen yields. Some technical difficulties have to be ironed out. The outcome will be of considerable value because of anticipated increased demands for testing. In co-operation with field officers' investigations, several points of interest have been recognised:—

- (i) When compared with examination of semen as a means of diagnosis, serological examination has been sensitive and specific.
- (ii) Some better understanding has been gained of conditions under which rapid spread of the disease may be expected. Suspicion might be particularly directed to precocious young rams with ready opportunity for homosexual behaviour in the late summer-autumn period of high libido.
- (iii) In many cases, eradication can be achieved by relatively few re-tests. This is in contrast to earlier experience where progress of the disease through affected groups was too rapid to allow its arrest by re-testing. The markedly different results on different occasions might be explicable by recognising conditions influencing rate of spread of the disease.

Vaccination's Role in Ovine Brucellosis Control.—In Australia this is not generally recommended. Some States prohibit vaccination but in N.S.W. the Department has the view that, in flocks that are continually at risk of infection and reinfection, efficient vaccination can play a valuable part.

A preliminary vaccination trial was commenced towards the close of the year to assess the efficiency of the two methods of vaccination developed in New Zealand; viz. simultaneous vaccination with Strain 19 and *Brucella ovis* adjuvant vaccine, and the double *Br. ovis* vaccination method. The challenge of rams in the vaccinated and control groups will be made with a N.S.W. strain of *Br. ovis*.

Testing for Ovine Brucellosis.—Some 49 per cent of the 9,200 samples received at Glenfield Station were from practitioners and there were comparatively few anticcomplimentary reactions compared with the previous year. This was no doubt due to the fact that most practitioners were supplied with blood and serum bottles from Glenfield.

So far as could be assessed from such information as accompanied the specimens the overall incidence of the disease would be in excess of 18 per cent.

Ram Fertility Research.—This work at Glenfield Veterinary Research Station is complementary to work proceeding at Trangie Agricultural Research Station. Relationship between temperature and seminal degeneration in wrinkled and plain bodied rams is being studied. Insulation and controlled heating have been installed for the purpose.

Seasonal variation of semen characteristics of wrinkled and plain bodied rams is also being studied. Groups of rams from both Cunnamulla and Trangie have been included.

The work includes insemination of groups of ewes at appropriate seasons of the year and examination of their reproductive parts after slaughter.

Sheep Nutrition Research, Glenfield

Early Weaning of Merino Lambs.—Aspects of early weaning of merino lambs at a mean age of seven weeks were studied in a trial at Condobolin Experiment Farm in the 1962 winter. About 2½ in. of rain had fallen in the autumn and the standing pasture had become sparse, brittle and fibrous.

Aims of the trial were: (i) to compare performance of weaned lambs, handfed in yards, with lambs allowed to graze dry fibrous pasture with their dams; (ii) to compare performance of weaned lambs, handfed in yards, with lambs fed in yards, with their dams, an equal quantity of the same diet plus a maintenance ration for the ewes; (iii) to compare effect of two protein levels in the diet of both weaned lambs and lambs handfed with their dams.

During the 10 weeks of the trial 1½ in. rain fell, but cold and heavy frosts retarded pasture growth in this period. The pasture grazed therefore remained brittle and fibrous.

The results of the trial were: (i) body weight gain of lambs (82 gm./day) fed with their dams on the poor quality pasture was significantly lower than gains by weaned lambs (133 gm./day) fed *ad lib* a mixture containing 17.6 per cent crude protein; (ii) lambs weaned and fed 17.6 per cent crude protein mixture had greater body weight gains (133 gm./day) than lambs which remained with their dams and were fed the same allowance (gain 118 gm./day); however, weaned lambs fed 10.6 per cent crude protein mixture gained less than unweaned lambs fed the same mixture with their dams (71 gm./day and 94 gm./day); (iii) body weight gains and dry matter intake of lambs fed 17.6 per cent crude protein mixture was greater than lambs fed 10.6 per cent crude protein mixture.

The general conclusions are that early weaning of merino lambs has advantages under such pasture conditions as described, provided protein content of the diet fed is approximately 17.6 per cent; and weaned lambs will make satisfactory gains of body weight at lower levels of protein intake although these gains are not likely to be greater than gains of lambs grazing with their dams; but the dams on pasture will experience losses of up to 15 Kg of body weight in assisting the unweaned lambs in this production.

Protein Levels at Maintenance.—This study continued. Digestibility trials and nitrogen balance trials with groups of 2-4 merino sheep have been conducted. The results show that digestibility of wheaten chaff used in previous trials was approximately 55 per cent, an appreciably lower value than normal. Small additions of lucerne chaff increased this digestibility figure.

Urea Feeding Blocks (Sheep and Cattle).—Feeding trials with blocks containing up to 35 per cent urea were conducted with sheep and dairy cattle. The four blocks tested could be classified into two types; those containing a small amount of

urea (4-6 per cent) and those containing relatively high quantities (35 per cent). The remaining constituents of both block types are varying amounts of salt, molasses, grain or grain by-products and a combination of mineral salts.

The results of the trial were: (i) Blocks containing 35 per cent urea weathered poorly when fed unsheltered. Up to 80 per cent of a 50 lb. block was dissolved during the period of observation when 5 in. of rain fell. Under humid fine conditions, these blocks were continually moist and soft on the surface. Blocks containing 4-6 per cent urea weathered only slightly. (ii) No case of urea toxicity was observed either with sheep or cattle, even though conditions of feeding were harsh. (iii) Consumption of different blocks varied. The mean intake of urea per sheep per day ranged from 4.4 gm. to 15.6 gm. For a group of 41 head of dairy cattle grazing under fair pasture conditions, the mean daily intake per head was 11.9 gm. This figure was recorded for a block containing 35 per cent urea.

SHEEP AND WOOL RESEARCH, TRANGIE STATION

Selective Breeding of Merino Sheep for Production Characters

High Heritability of Fleece Weight and its Component Measurements.—Current shearing results have clearly shown this. Results from the single character selection groups show the strong genetic correlation between high fleece weight and broad crimping wool, whereas body weight, skin fold and staple length have but slight association with the production measurement. Data on incidence of fleece rot have shown that selection for high fleece weight is not associated with increased susceptibility to this condition.

The Selection Demonstration Flock (selection on measurements) is now clearly ahead of the Stud, while still maintaining its plain bodied, open faced, big framed characteristics. Extensions of this work are under way. These will estimate the difference between Trangie Station and Stud environments and so enable comparison between the S.D. flock and Stud sheep in general.

Value of Shoulder Strip Sampling of Rams.—Further observations both at Trangie Station and on a commercial Stud have confirmed the value of the technique of shoulder strip sampling in ranking rams on wool production in stud classing.

Comparisons with "Bungaree" (S.A.) Merinos.—In comparing Trangie Station's Peppin flocks with the South Australian "Bungaree" animals, the second draft of purchased ewes outproduced Random Peppin by 40 per cent and Stud Peppin by 10 per cent of clean wool. Comparative figures were also produced on 18 month old ewes grown at Trangie. Here the production figures showed a 38 per cent advantage over Random Peppins and a 21 per cent advantage over the Stud Peppins.

Weaning Weight Selection Groups.—Analysis of the response to the first four generations of selection has been commenced. Interim results show that response is greater in a high than in a low direction and that response to selection is moderately high, particularly with ewes.

Poll Merino Breeding

A satisfactory method of surgically dehorning ram lambs could not be developed.

Production of Polled and Horned Groups Compared.—Because of failure of the dehorning approach, two castration experiments were used to compare production of polled and horned groups of rams and wethers. Analysis showed that segregation of the poll gene had little influence on production characters irrespective of horn growth.

Fertility of Poll and Horned Rams Compared.—Results from two grazing properties have again shown no significant difference in the fertility of poll and horned rams.

Influence of Selection on Efficiency of Conversion of Feed to Wool

Following completion of the first phase of this experiment, a low plane of nutrition, the three groups "Fleece Plus", "Fleece Minus" and "Random" were raised 20 per cent in body weight to forward store condition and maintained at that level. Despite equivalent increases in food intake and body weight by the three groups, the response in wool growth has not been uniform.

The "Fleece Plus" sheep responded to the improved nutrition with a 57 per cent increase in wool production whereas the increase for the "Fleece Minus" sheep was 25 per cent.

Preliminary results from the third level of nutrition (fat—a further 20 per cent increase in body weight) have indicated a further differential response in wool growth.

This work has now been extended to include groups where pasture intake and wool growth are being measured under grazing conditions.

Influence (?) of Season and Light on Wool Growth

With penned rams on a standard feeding regime, there was no evidence that the seasonal changes in hours of daylight exerted any control on rate of wool growth, relative to a control group with reversed seasonal lighting.

Influence of Selection on Fertility

An accurate technique for recording the individual lambing performance of ewes under field conditions has been developed.

Folds Influence.—The first year's results from reciprocal matings of "Folds Plus" and "Folds Minus" selection groups have been fully confirmed. The low conception rate and reduced twinning of the "Folds Plus" flock is due to reduced fertility of rams. The high death rate of "Folds Plus" ewes and single lambs is associated with the heavy birth weight of lambs.

Face Cover Influence.—At the 1962 spring lambing, the percentage of lambs surviving to four weeks of age was 128 for the "Face Cover Minus" flock and 84 for "Face Cover Plus". This enormous difference was almost entirely associated with differences in percentage of twins born and in percentage of twin lambs born which survived to four weeks. The flocks showed no difference in percentage wet ewes.

Environmental Influence on Ram Fertility

Folds and Season.—Measurement of the semen quality of "Folds Plus" and "Folds Minus" sires showed that the "Folds Minus" group were superior in late spring and again in early autumn. The particular measurements that showed significant differences were "total live spermatozoa" and "motility reading".

The semen collected in March, 1963, was used to inseminate 233 ewes which were subsequently slaughtered. A 20 per cent difference in percentage pregnant ewes favoured the group mated to "Folds Minus" rams.

Artificial Insemination of Sheep

At the routine insemination of experimental ewes in 1962, the separate teasing of maiden ewes proved very successful. Only two per cent failed to accept service. Almost all ewes with poorly defined raddle marks were found to be infertile to service.

TRANGIE STATION'S SHEEP WORK WITH OTHER EXPERIMENT FARM AND STATIONS

Border Leicester x Merino Fixation (Condobolin Experiment Farm)

Spring vs Autumn Joining.—The March, 1962, joining yielded 150 per cent of lambs tagged and 94 per cent of wet ewes. In contrast, ewes again failed to mate at the 1962 spring joining, irrespective of nutritional treatment prior to joining. Because of the repeated failure of spring joining, the spring joining flock has now been reduced to 100 ewes. The other 800 are mated in autumn.

F1 vs F2 Ewes.—A comparison has been made of F1 and F2 ewes grown together. No production measurement varied more in the F2 than it did in the F1. Fleece weight was significantly higher in F1 ewes—0.3 lb. greasy and 0.2 lb. clean wool. The F1 ewes showed significantly higher percentages of wet ewes and multiple births, producing an average of 41 per cent more lambs tagged. Lamb losses were significantly higher in F3 lambs.

Poll Gene and Lamb Growth Rate (Tamworth Research Station)

Second Year's Results.—These confirmed the previous observation that the poll gene did not influence the growth of prime lambs.

With regard to castration treatments, sterilised rams and those with the half testes operation grew significantly faster than other groups, but price penalties against staggy carcasses made the sterilised rams uneconomic and brought the "half testes" group to parity with ewes and wethers.

Surgical removal of testes, leaving behind the epididymis, produced a group of wethers. Analysis of meat from ram and wether lambs is being carried out by the C.S.I.R.O. Meat Research Laboratory, Brisbane.

Dorset Horn vs Cheviot as Sire of Prime Lambs (New England Agricultural Research Station)

Dorset Horn Again Superior.—Dorset Horns again proved superior to Cheviots as sires of prime lambs. The Dorset cross lambs yielded 14 per cent higher live weight, 11 per cent higher carcass weight and 12 per cent higher economic return per lamb. Within breeds, good and poor type sires had no significant influence on lamb production.

Breeds Comparison Trial (Temora Experiment Farm)

The results of the first spring lambing showed 131 per cent of lambs marked to Corriedales versus 100 per cent for Polwarths. South Australian and Peppin Merino ewes have been included in the trial as from the autumn 1963 mating.

Selection for Growth Rate in Stud Dorset Breeding (Temora Experiment Farm)

The first mating in this new project was commenced on 21st March, 1963.

Breeds Comparison Trial (Cowra Experiment Farm)

The results of the lambings 1961-63 have been analysed, confirming the first four years' published results. These show marked superiority of the combination of Dorset Horn ram mated to Border Leicester x Merino ewes. Ewe wastage over the last three years has averaged 15 to 20 per cent, the higher figure referring to the Corriedale.

Hybrid Vigour in Lamb Production (Cowra Experiment Farm)

The first reciprocal matings between the Border Leicester and Merino breeds were carried out in March, 1963.

Autumn, Spring and Dual Lambing Trial (Cowra Experiment Farm)

Preliminary analysis of the first five years' results show 35 per cent more lambs marked to the spring as compared to the autumn lambing. The Dual group holds a 12 per cent advantage over the spring lambing. Very few ewes in the Dual flock are lambing twice per annum. Growth rate of lambs at 0.67 lb. per day, favours the spring drop by 8 per cent. At birth spring drop lambs weigh a pound heavier than autumn drop lambs. Similar returns from wool have been obtained from the three flocks.

Sheep Breeding and Pasture Management (Shannon Vale Nutrition Station)

Initial matings of the high and low fleece weight flocks were carried out in May, 1963.

TRANGIE STATION'S CO-OPERATIVE FIELD RESEARCH IN ASSOCIATION WITH DISTRICT SHEEP AND WOOL OFFICERS

Analysis of the first year's results from nine flocks indicate that a ewe's lambing history can influence its face cover score.

Face cover scored prior to mating only decreased the percentage of wet ewes at muffled grades 5 and 6.

There was an extremely strong association between fold score and fertility.

Greasy fleece weight was not influenced by face cover but showed the predicted rise with increasing fold score.

The percentage of quality fleeces decreased with rises in either face cover or fold score.

SHEEP INDUSTRY RESEARCH AT LEETON STATION

Nutrition and Body Condition Effects on Breeding Season and Fertility

Previous work at Leeton Station showed that fertility of ewes joined in early summer was affected by body condition at joining and by plane of nutrition from three weeks before and during the joining period; also, that body condition of ewes and plane of nutrition during winter and spring had only minor effects on initiation of the breeding season.

It was considered necessary to confirm these results by further experimentation when joining occurred in autumn as well as early summer, and to make more detailed observations on ovulation rates. Accordingly, a 3x2x2 factorial experiment was carried out during 1962-63. Treatments were as follow:—

- (i) Three planes of nutrition from 12 weeks before joining to three weeks before joining (high, medium and low);
- (ii) Two planes of nutrition, i.e. flushed and not flushed, from three weeks before joining to two days after the occurrence of oestrus (see later)—high and low;
- (iii) Two planes of nutrition from two days after the occurrence of oestrus to slaughter (see later)—high and low;
- (iv) Two periods of joining—
 - (a) early summer, 6th December, 1962;
 - (b) autumn, 29th March, 1963.

All the ewes were grazed on irrigated white clover-paspalum pastures during the experiment. Medium and low planes of nutrition were produced by restricted grazing and while not being grazed ewes were locked up in bare yards. High plane ewes were given *ad lib* grazing

Early summer joined ewes were joined to harness vasectomised rams in mid October, 1962. Ewes were inspected thrice weekly for occurrence of oestrus. Joining to entire Dorset Horn rams in early summer occurred on 6th December, 1962 and in autumn on 29th March, 1963. During these periods ewes were inspected daily for occurrence of oestrus. Two days after ewes were first observed in oestrus they were allocated to either a high or low plane of nutrition.

At slaughter three to four weeks after the occurrence of oestrus genitalia were examined for occurrence of ovulation and embryos.

Results of this experiment are still being analysed, but interim conclusions are: (i) flushing increased the proportion of multiple ovulations for both early summer and autumn joined ewes; (ii) flushing appeared to be equally effective in early summer and autumn-joined ewes; (iii) proportion of multiple ovulations in the groups was dependent on liveweight at mating as well as the flushing effect; and (iv) body condition and plane of nutrition had limited effects on initiation of the breeding season in the spring. Those ewes receiving good nutritional conditions throughout began to exhibit oestrus earlier than the remaining groups.

Anoestrus in Border Leicester x Merino Ewes

Past observations at Leeton Station on anoestrus of breeding season of Border Leicester x Merino ewes have been confined to oestrus detection using harness vasectomised and entire rams. No direct observation has been made on the ewes.

In 1962-63 160 Border Leicester x Merino ewes were joined to harness vasectomised rams on 8th August, 1962, and each fortnight ten of the ewes were slaughtered at Leeton Station and the genitalia were collected. The study revealed that the number of ewes ovulating gradually declined during August and September, 1962.

When ewes were slaughtered on 26th September, 1962, they were all in anoestrus. This situation continued until 2nd January, 1963, when 20 per cent of slaughtered ewes had ovulated.

There was no reason to suspect the rams' efficiency in detecting oestrus.

Border Leicester x Merino Ewes Breeding Season in Three M.I.A. Environments

At the Leeton Station, Border Leicester x Merino ewes consistently fail to exhibit oestrus in October and November. The breeding season commences in late December-January. In many instances successful matings of Border Leicester x Merino ewes in October-November have been reported from prime lamb producers. At the same time there are many experiences comparable to that at Leeton Station.

Observation and experimentation suggest that this variability of the breeding season of Border Leicester x Merino ewes is due to some aspect of management and environment. To test this hypothesis, a trial is being conducted in conjunction with two co-operating farmers in the M.I.A. The two farms adjoin; both run Border Leicester x Merino ewes for prime lamb production, and both join their ewes to Dorset Horn rams in October.

On *Farm A*, joining at this time has been highly successful over a number of years. Nearly all ewes have mated by the end of November and about 100 per cent of lambs have been marked yearly. On *Farm B* the experience has been similar to that of Leeton Station over the past three years.

A group of 300 Border Leicester x Merino ewes, born late in winter 1961, were purchased in the central west of New South Wales in May, 1962. The ewes were divided at random in three groups of 100 and placed on *Farm A*, *Farm B* and Leeton Station. This transfer took place in May, 1962.

Ewes at the Station and on *Farm A* were joined in the first week of January, 1963, and on *Farm B* in mid-October, 1962. Joining on *Farm B* was completed at the end of December when 46 per cent of the ewes had joined. Ninety-three per cent of the ewes on *Farm A* were joined during the six weeks mating period. On Leeton Station 79 per cent of the ewes joined over the same period. This difference is statistically significant.

Since ewes at the Station and on *Farm A* were not joined until January, the results are of limited value. However, two features did emerge: (i) breeding seasons of ewes at all sites did not reach their maximum intensities until January; and (ii) although bodyweights of ewes at the Station and on *Farm A* were similar and the breeding seasons of ewes commenced at much the same time, a greater proportion of ewes were joined on *Farm A* than at this Station.

Factors Affecting the Breeding Season of Border Leicester x Merino Ewes

In a long-term experiment the following factors are being studied in relation to initiation of the breeding season of Border Leicester x Merino ewes:—

- (i) time of the year at which the ewes are born (autumn versus spring);
- (ii) age of ewe;
- (iii) previous breeding performance of ewes;
- (iv) accession to puberty of ewes.

These ewes are being bred at Yanco Agricultural Research Station and are transferred to Leeton Agricultural Research Station at weaning. Only limited results are available as yet for this trial.

At present three drops of ewes are available. These lambs were born in spring 1961, autumn 1962 and spring 1962. Vasectomised rams were joined to the spring drop 1961 and autumn drop 1962 ewes in mid-October, 1962. The spring drop 1962 ewes were not joined to vasectomised rams until their transfer from Yanco Agricultural Research Station in February, 1963. The spring drop 1961 and autumn drop 1962 ewes entered their breeding season in February-March, 1963. However, the spring drop 1961 ewes came into oestrus three weeks earlier on the average. Spring drop 1962 ewes did not commence to come into oestrus until May.

*Merino vs. Border Leicester x Merino Ewes for
Prime Lamb Production*

Comparisons of Border Leicester x Merino ewes and Merino ewes as prime-lamb mothers have been in progress since February, 1961. Two years' results have been obtained; from ewes that were mated to Dorset Horn rams from 27th February, 1961 to 4th April, 1961 and from 8th December, 1961 to 19th January, 1962.

Observations have been made on various characters of the ewes of each breed and their progeny; including: lambing performances (including lamb loss); wool production; milk production and death rates of the ewes; birth weights; growth rates; and monetary returns of the lambs and wool.

The crossbred ewes have out produced the Merino ewes in every way except wool production. In wool production there has been little difference between the breeds. This is surprising.

Differences in percentages of lambs born, dead and alive, have been relatively small, but the Merino ewes have lost significantly more lambs than crossbred ewes between birth and marking. This has resulted in a significantly higher lamb marking percentage for crossbred ewes.

Over the two years, average returns for per ewe mated were:—crossbred ewe, £3 2s. 8d.; Merino ewe, £2 3s. 8d.

Caution must be applied to those results for a number of reasons, including: (i) the crossbred ewes were at Leeton Station twelve months longer than the Merino ewes; (ii) although body weights of the two breeds were very similar at commencement of the trial, body weights diverged in 1961 resulting in a difference in favour of crossbred ewes of 28 lb. liveweight and this difference has remained about constant ever since; (iii) assessment of results has been on a production per head basis and no account has been taken of the relative efficiency of the two breeds.

The experiment is continuing.

Production per Acre

This experiment has now been completed. Analysis and writing up of these results are pending. Design of the experiment has been outlined in previous Annual Reports. A summary of the three years' results is given in the following tabulation:—

Group	Year	Per cent. Lambs Sold per Ewe Mated	Average Carcase Weight		Average Greasy Wool Production		Gross Average Return per Acre; Wool Plus Lamb
			lb. Head	lb. Head	lb. Head	lb. Head	
4	1960-61	119	34	160	9.1	36.4	£ s. d. 22 19 9
	1961-62	142	23	128	9.1	36.4	21 5 2
	1962-63	122	31	153	9.0	36.0	22 8 0
	Average	128	29	147	9.1	36.3	22 4 4
6	1960-61	109	30	193	9.1	54.6	30 8 3
	1961-62	121	21	148	9.3	55.8	27 5 2
	1962-63	90	28	148	9.4	56.4	26 6 4
	Average	107	26	163	9.3	55.6	28 19 11
8	1960-61	114	29	262	7.9	63.2	37 2 7
	1961-62	116	20	184	8.6	68.8	30 4 10
	1962-63	84	27	181	9.2	73.6	33 6 7
	Average	105	25	209	8.6	68.5	33 11 4

These results are tentative pending statistical analysis, but interim conclusions are:—

- Production per head is maximal at the lightest stocking rates;
- Production per acre is maximal at the highest stocking rates;
- Differences between stocking rates between years, in terms of production per acre, have diminished. This has been due almost entirely to increasing differences in percentages of lambs sold;
- Monetary returns are given as gross figures only. The only variable cost to be considered is the annual cost of ewes. If a figure of £2 per ewe per annum is taken as the annual cost (includes shearing costs, stock medicines, marketing costs of wool and lamb and replacement costs), the comparative average nett return over the three years would be:—four sheep per acre—£14 4s. 4d.; six sheep per acre—£16 19s. 11d.; eight sheep per acre—£18 4s. 8d.

*Pre-mating Shearing and Lucerne Feeding Effects on Fertility
of Maiden Border Leicester x Merino Ewes*

This experiment is in progress. No results are yet available.

In a previous experiment at Leeton Station, negative results were obtained when ewes were shorn just prior to mating compared to ewes carrying four months' wool. As these results contradicted overseas results it was felt that this trial should be repeated in more detail.

CATTLE RESEARCH, VETERINARY STATION, GLENFIELD

Veterinary

Mastitis.—Of 468 milk samples examined, 318 showed cellular changes indicative of mastitis. *Staphylococcus* was again the most common causal organism, being isolated from 186 samples. Streptococci were recovered from forty-eight samples. A number of the isolated organisms were tested for their anti-biotic sensitivity, with the following results:—

Antibiotic	Staphylococci		Streptococci	
	No. Tested	Per cent Sensitive	No. Tested	No. Sensitive
Chlorotetracycline	118	113	17	16
Chloramphenicol	118	114	17	16
Erythromycin	118	108	17	13
Penicillin	118	56	17	12
Streptomycin	118	108	17	16
Oxytetracycline	118	105	17	15
Tetracycline	118	113	17	14
Triple Sulpha	118	..	17	

Enterotoxaemia of Cattle.—Material was received from thirty-seven cases of suspected enterotoxaemia. Of these, ten were submitted from calves and weaners, eleven from steers and heifers and fourteen from adult cattle. The majority were associated with sudden death or death within twenty-four hours. In fourteen cases, the presence of an enterotoxin was demonstrated by mouse injection of bowel filtrates.

In four cases only where an enterotoxin was demonstrated was neutralisation of the toxin with *Clantridium perfringens* type D antiserum successful. These cases involved three calves or weaners and one case from a steer. In six instances neutralisation could not be achieved. In four selected cases—from three aged cows and one calf—neutralisation could not

be obtained by use of *Clostridium perfringens* types A, B, C and E antisera. Attempts at culture failed to produce strains of *Cl. perfringens* of sufficient toxin production for typing. The majority of cases had a history of sudden death within twenty-four hours, sometimes in association with suspected bloot and Grass Tetany.

Johne's Disease.—Material from thirty-one head of cattle was received during the twelve months for examination for Johne's disease. These cattle were apparently healthy animals slaughtered at abattoirs but came from a herd where Johne's disease has existed for some time.

The serum from one of these animals was positive to the C.F. test but smears prepared from the faeces failed to show the presence of the organism. The remaining cases were negative to the C.F. test and to faecal smears examination. Cultural examination was undertaken on four cases with a negative result in each case. There is still insufficient information on which to base an evaluation of the C.F. test.

Leptospirosis.—In conjunction with officers of the School of Public Health and Tropical Medicine, results of a ten-year survey on incidence of bovine leptospirosis in New South Wales were prepared for publication. Leptospirosis was evident throughout almost the entire sampled area of the State, and no less than 23 per cent of 1,458 herds sampled were shown to have reactors. Of 7,304 individual sera tested, 12.4 per cent reacted. *L. pomona* accounted for 10.5 per cent and *L. hyos* for 1.4 per cent, while the remaining reactors (0.5 per cent) were due to either *L. grippityphosa* or *L. hebdomadis*.

Q Fever Reservoir Role of Cattle and Sheep.—In co-operation with the School of Public Health and Tropical Medicine and the State Health Laboratory at Lidcombe, a survey is being made over a twelve months period on sheep and cattle slaughtered at Homebush and Newcastle Abattoirs for Q Fever and Brucellosis. The results of this survey will be considered in association with zoonoses in abattoir workers, and a human serological survey by the State Health Department.

Ill Thrift in Beef Cattle.—Field trials are being conducted at Hartley, Leeton and Armidale to determine the role played by parasites in poor growth rates in cattle, and to determine whether use of efficient anthelmintics can improve body weight gains.

The Leeton trials are at the Leeton Agricultural Research Station with Aberdeen Angus steers, in conjunction with "Production per acre" trials and with other groups. Regular treatment is being given with thiabendazole for roundworms (especially *Ostertagia ostertagii*) and hexachlorophene for liver and stomach fluke. In the Hartley trials Herefords are being used and dosing with trace elements is involved, as well as anthelmintics.

In each trial the cattle are weighed and treated monthly. They will subsequently be slaughtered for detailed examinations. All specimens, including faecal and blood samples, are to be examined at Glenfield Station.

Although the trials are still proceeding it is already apparent that: (a) liver and stomach fluke and *Ostertagia* are commonly present, to varying extents, in beef cattle of all ages; and (b) these parasites exert little apparent influence on rate of growth unless present in large numbers.

Anthelmintic Trials.—Comparative, controlled preliminary trials have been carried out at country centres and at Glenfield Station to determine the anthelmintic efficiency of ultra-mixed phenothiazine, haloxon, Bayer S940, thiabendazole, kempak, hexachlorothane, hexachlorophene and mintic. Thiabendazole was also tested for efficiency by intraperitoneal injection, with a negative result.

Medicated Licks for Worm Control.—Practicability of worm control by daily small dosing with an anthelmintic incorporated in a molasses lick is being investigated. In initial trials at Glenfield Station the calves were disinclined to take the medicated lick. It contained 20 gm. P.T.Z. per lb. In subsequent paddock trials worm burdens faded out in all groups. The work is now being repeated at Camden Park Dairy with young dairy calves. At the same time calves are being dosed at a low rate daily at Glenfield to determine effect on viability of worm larvae.

Cattle Worm Survey.—A survey is now being done in the Hunter Valley by the Newcastle District Veterinary Officer. Examination of specimens, including whole worm counts, will be carried out at Glenfield Station.

Toxicity of Insecticides.—Several anthelmintics and insecticides were tested for toxic levels. In calf dipping trial No. 9, batches of two very young calves were plunge-dipped for 10 seconds; four times dipped, at three day intervals, in diazinon and Shell S.D. 4294. The concentration was double that recommended for control of cattle tick. Toxic effect was not observed in either case. Diazinon was administered to calves per os at 150, 250 and 350 mg/kg. Only slight evidence of toxicity was seen, at the higher dose rate.

Bovine Infertility; Extent, Causes and Test Methods.—2170 individual bovine samples were examined, excluding serum samples. Of the herds concerned, 199 are listed as "not previously examined". The majority were dairy herds.

Samples from 132 of the 199 "new" herds were submitted to the vaginal mucus agglutination (VMA) test for vibriosis. Positive reactors were found in 69 and doubtful reactors in another 19 herds. Thus the proportion of "new" herds reacting (66.6 per cent) was even greater than in the preceding year (61.1 per cent). Again only a small proportion of the cows in most of the herds was tested.

There was a further decrease in number of herds from which *Trichomonas foetus* was recovered. The three herds involved included a beef stud near the Queensland border.

In two instances this year and in one previous instance, vibrio organisms were detected in bovine vaginal mucus samples which contained trichomonads also. This evidence of concurrent presence of both organisms in the same animal on occasions (and not merely in the same herd) further complicates the issue as regards suspected cross-agglutination between vibrios and trichomonads and also VMA testing for trichomoniasis. It reinforces doubts of the validity of the former and the value of the latter.

Observations suggest that immobilisation probably would be a sounder criterion than agglutination in tests for trichomoniasis. Serum used in *Tr. foetus* culture media must first be heat-treated to prevent it from killing trichomonads. Further, there have been various degrees of agglutination of trichomonads in various culture media, without the addition of tests mucus or serum.

Concerning laboratory diagnosis of vibriosis, and difficulty of recovering the organism on culture, it is of interest that on one occasion a visible growth appeared in semi-solid agar only after 11 days incubation under 10 per cent CO₂. In this instance, a very small number of vibrios—and no other bacteria—had been detected on direct examination of the specimen; and no growth occurred on a solid medium, viz., the widely used blood-agar plate. This illustrated the value of using semi-solid agar in addition to a solid medium, and of continuing incubation beyond the 3-5 days period in suitable cases.

The previous observation that bovine serum even at dilutions of 1:20 and 1:40 did not necessarily give positive reactions to agglutination tests for vibriosis led to inclusion of any samples containing blood in routine VMA testing. Some authorities have warned against this, on the grounds that "all bovine sera contain non-specific agglutinins". To eliminate or minimise the colour factor, such mucus samples were covered with a layer of cotton wool before the 0.3 per cent formal saline was added for extraction of agglutinins. The supernatant fluid remained clear and suitable for testing next day. The same procedure is now followed with purulent samples and with oestral or other very fluid mucus samples. This and other factors in diagnostic methods for vibriosis have been discussed in a paper prepared for publication. The paper deals primarily with a survey of incidence of vibriosis in dairy cattle in N.S.W. in the three years 1958-61.

Further investigations re cultural and biochemical characteristics of *Vibrio fetus* showed that degree of catalase activity can vary with environmental differences; notably the amount of oxygen available. Thus a standardised catalase index seems called for if this test is to be used as a criterion of pathogenicity. These observations have been incorporated in a paper prepared for publication.

Preputial scrapings and smegma from 47 abattoir-slaughtered bulls selected at random and from three live bulls proven to have been carrying and transmitting genital vibriosis organisms at service all returned negative *Vibrio fetus* agglutination tests. This, coupled with the normal appearance of all the genitalia, supports the view that this organism is not pathogenic to bulls.

To study relationships between vibrios from bovine and ovine hosts, ewe sera were submitted to agglutination tests with both ovine and bovine strain antigens, in parallel. Of about 60 such sera tested to date, most reacted with a standard bovine strain antigen at dilutions ranging from 1:20-1:80. A very much smaller number reacted with the ovine strain antigens used. Some interesting conclusions of practical importance may be reached in due course in this current investigation. Correlation of test results with individual and flock breeding history and performance is essential to it.

Sporadic Bovine Encephalomyelitis.—Co-operative work with the C.S.I.R.O. has established that the condition previously referred to as Transmissible Serositis is identical with Sporadic Bovine Encephalomyelitis (S.B.E.).

Current laboratory work on the condition has been confined to application of a Complement Fixation (C.F.) test. This test has made it possible to demonstrate antibodies in sera of cattle and sheep. However, as members of the psittacosis-lymphogranuloma group share complement fixing antigens and as, on demand, the test has commonly been applied as a diagnostic rather than experimental tool, proper interpretation of reactions has frequently been impossible.

Where it has been possible to relate C.F. test results to other evidence of the presence of S.B.E., the demonstrable presence of antibody appears to be better related to the clinical than to the convalescent phase of the disease. In terms of principles of immunology, this allows considerable room for hypothesis regarding pathogenesis and carrier status.

BEEF CATTLE RESEARCH, LEETON STATION

Nutrition and Management Research

Production per Acre Experiment.—The third full year has been completed with cattle grazing the three "farms" from 16th May, 1962, to 30th April, 1963. To examine the relative performance of Leeton-bred steers and the introduced Wollongbar steers, both types were included in the experiment for the first time.

Contrary to expectation the Leeton-bred animals did not perform as satisfactorily as the introduced steers. This would be accounted for in part by the fact that at the start of the experiment the Leeton steers were about 200 lb. heavier and in more forward condition than the Wollongbar steers.

Taking the Wollongbar steers as yardstick the 1962-63 production year was the best so far, with animals gaining an extra 40 lb. over 1961-62 gains. Financial returns were also up. Nevertheless the same overall picture has been shown.

The greatest production and return were achieved in the heaviest stocking rate, at expense of carcase quality. Wollongbar steers in the one beast per acre unit graded 100 per cent first quality, while only 50 per cent graded first quality in the 1½ and 2 beasts per acre.

Winter performance was again poor even though pastures seemed adequate. There was a period of feed shortage through late summer.

For the cattle there appear to be two alternatives:—

- increase the proportion of summer to winter pasture above 1:2; or
- earlier marketing of stock—probably towards the end of the year. In practice a grazier would turn-off those beasts which had finished, and so reduce stocking pressure.

Silage Supplementation of Pasture.—Following the 1961 experiment in which Hereford yearling steers grazed winter pastures from June through December at stocking rates of 1.5 and 1.9 beasts/acre, the experiment was modified this year.

Previously, stock had been grazed and supplemented only within the upper limits of pasture availability and all groups gained well at 2 lb./head per day. Stocking in the 1962 experiment was at 1.5 and 4 beasts/acre. The intention was

to so stock that the unsupplemented heavily stocked groups would just maintain or even slightly lose weight. This was achieved, as is apparent in the following tabulation:—

Group	Liveweight Gain	
	25th May, 1962 to 11th December, 1962	11th December, 1962 to 30th April, 1963
	lb.	lb.
Grazing—		
Low stocking rate—pasture alone	375	77
Low stocking rate—plus silage	371	77
High stocking rate—pasture alone	20	207
High stocking rate—plus silage	— 56	209
Yard Feeding—	6 June, 1962, to 11 December 1962	
Zero grazing	288	....
Pasture hay	231	....
Pasture silage	157	....

Silage supplementation has shown: (i) no apparent affect at low stocking rate (high plane of nutrition where liveweight gains have again been 2 lb. per day); (ii) increased animal gains (76 lb.) at high stocking rates (low plane of nutrition which has been approximately maintenance level). Likewise supplementation improved carcase quality at slaughter.

There was a marked pasture saving effect due to silage supplementation at the high stocking rate.

Representative steers were held over the summer/autumn period until 30th April, 1962, on pasture. The objects of this were to: (i) examine compensatory growth (because when all steers were run together the previously heavily stocked animals regained much of their leeway); (ii) obtain information on the performance of this class of animal when run on summer irrigated pastures (because the gain of only 77 lb. during this period for the low stocking rate group had been disappointing; only 0.5 lb./day); and (iii) study the effect of plane of nutrition on carcase development and final carcase quality.

Yard Feeding Studies.—The performances of steers yard-fed over the winter-spring period were compared, to again examine:—the value of pasture mechanically harvested and fed in the feed lot ("zero grazing"); straight pasture hay; and pasture silage.

The tabulation recorded under the preceding heading shows also these yard-feeding results. Zero grazing was superior to the other feeds. Even so, the animals fed harvested pasture did not perform as well as the low stocking rate groups of grazing steers.

There is evidence in relevant literature that silage supplemented with hay will give superior results. Two other groups were fed: 1/3 hay : 2/3 silage; and 2/3 hay : 1/3 silage. Neither of these groups of steers performed any better than the straight silage-fed animals.

Milk Production and Consumption in Beef Cattle.—These studies continued at Leeton Station using Angus cows and calves. In addition, fat and solids—not-fat content of milk have been estimated.

Unsatisfactory Growth of Beef Cattle.—A number of aspects have been examined, including:

(a) *Possible cobalt deficiency:* Liver biopsy and blood samples failed to reveal low Vitamin B12 levels in cattle on Leeton Station. Analyses were done by the C.S.I.R.O., Adelaide.

(b) *Potash survey of pasture:* This was undertaken because of the importance of potash in meat production and its possible deficiency under irrigation. Levels of potash and also of phosphorus, calcium, magnesium, sodium and manganese proved to be adequate.

(c) *Copper levels in bovine liver:* Samples showed these to be marginal, and a general survey has been undertaken.

(d) *Pasture intake and digestibility studies:* These are about to commence, with both sheep and beef cattle. Allocation of Beef Industry Research Funds has facilitated this work at Leeton Station. It is one of the major beef cattle investigations. A research officer has been appointed specifically for this work.

(e) *Internal Parasites of Beef Cattle*: A project has been commenced to examine the importance of internal parasites. Three experiments have been undertaken, involving (i) calves treated with thiabendazole monthly and three-monthly, (ii), steers in the "Production per Acre Experiment", treated with thiabendazole (some of these animals were also used to study effect of hexachlorothane and hexachlorophene on liver and stomach fluke); (iii) yearling heifers ex Wollongbar, treated with thiabendazole and kempak (the only experiment in which a significant effect was obtained by treatment).

(f) *Winter-Spring performances of Angus weaners*: The winter-spring performance of the Hereford yearlings grazing the "Silage" areas during the last two years has been very satisfactory but the Angus weaners grazing the winter "Production per Acre" areas have not done well. An experiment was commenced on 13-6-63 to find the reasons. The multi-factorial 3x2x2 design is using three different areas, two classes of stock, and two management systems (set stocking and rotational grazing) which were employed on the "Silage" and "Production per Acre" areas previously.

(g) *Comparison of irrigated and dry land grazing*: Performances of cattle grazed under irrigation and dry land conditions are being compared. Twelve Hereford and 12 Angus steers have been transferred to dry land grazing at the Yanco Agricultural Research Station for this purpose. These will be compared with similar stock on the Leeton Agricultural Research Station.

Beef Breeding Research

Improvement of Breeding Stock.—Arising from Agricultural Extension Grant Project 108, officers of Leeton Station have travelled to the Bombala demonstration for record taking. In co-operation with Biometrical Branch the Special Veterinary Research Officer has drawn up a programme for analysis of the data which is currently being prepared from two herds.

New cards have been printed for use by the various District livestock officers concerned in this Project, for which Leeton Station is the organising centre.

CATTLE TICK RESEARCH STATION, WOLLONGBAR

Staff and Facilities at this New Station

At 1st July, 1962, the staff comprised: the Director, one veterinary officer—attached to the C.S.I.R.O. for special babesiosis training until August, 1962, one senior assistant inspector of stock, Board of Tick Control, attached to the Station to act as supervisor of farm operations, and one junior farm hand. By 30th June, 1963, the additional staff comprised: one research officer (acaricide application), two field assistants and a laboratory technician. As well, members of dip-building and fencing gangs of the Board of Tick Control worked at the Station through the year.

The first tick-proof stalls were brought into use in August, 1962, and all 24 were completed by June, 1963. Two cattle dips, with experimental additions, including four supply tanks to hold used fluid, and a calf dip, have been used in association with a special examination crush. A cattle spray unit awaits installation.

The insecticide laboratory, of 6 squares, was brought into use as a temporary general laboratory. Later in the year a further small laboratory was constructed to allow research to proceed pending completion of the main building.

Construction of the main laboratory and administrative building commenced in March, 1963.

Research

Tick Fever Work.—A brain smear survey is in progress at the Byron Bay Abattoirs. Most cattle slaughtered there come from properties between Lismore and the Queensland Border. To the end of the year, 1,422 random brain samples had been examined. All proved negative both for *Babesia argentina* and *Babesia bigemina*.

In addition, 351 smears from cattle of known origin (53 farms) proved negative. Serum samples corresponding to the brain smears of known origin have been preserved to be used when the Complement Fixation test for *Babesia* is employed at the Station in the near future.

Investigations on Quarantine Herds.—(a) *The Piggabeen Property*.—The tick fever outbreak occurred in June, 1962. Thick blood films from the herd have been examined at intervals of six weeks to a total of 400 films. No further carrier has been found since the original three. By arrangement with C.S.I.R.O. this herd will be Complement Fixation tested at the end of the first year of quarantine.

(b) *The Doubtful Creek-Dyraaba Creek Property*.—The tick fever outbreak occurred in December, 1962. Thick films were examined from the 210 head of cattle. No carrier was found. A thick blood film survey of properties adjoining those concerned is being conducted. Some 200 animals examined to date proved negative. Complement Fixation examination of the quarantined herd proved negative.

These studies have indicated that incidence of tick fever in New South Wales is even lower than had been expected, and the residual pockets are correspondingly hard to find.

Acaricide Application.—Experiments began in June, 1963.

Tick Life History Studies.—Studies of the tick after dropping from the cattle have been expanded. More evidence is available to show that in favoured situations at Wollongbar, some development of tick eggs can take place in April. The experiments also indicate that the non-parasitic life of ticks at Wollongbar is shorter than Queensland evidence would have indicated.

Test Exposure Sites.—Sites away from the Station have been established at Pretty Gully (2) and at the Tropical Fruit Research Station, Alstonville. Development of these and other sites has been retarded by delays in appointing staff.

PIG RESEARCH, VETERINARY STATION, GLENFIELD

Swine Fever Research

Gel Diffusion Precipitin Test.—9,032 sera were tested. The total included also some human, horse, cattle, sheep and goat sera. Antibodies cross reacting with the swine fever antigen were recognised in cattle, sheep and goats. Application of the test to pig sera, apart from its use as a diagnostic tool, included surveys of feral pigs and pigs slaughtered at abattoirs throughout the State.

The results were as follows:—

	Tested	Per cent. Reactors
Feral pigs	216	5.1
Ex Abattoirs, north coast	1,254	2.3
Ex Abattoirs, other areas	914	13.1

Antigen supply is still the limiting factor on number of tests which can be done. Following Littlejohns' encouraging results at Weybridge in antigen extraction and purification, repetition of this work was attempted at Glenfield Station but has been halted pending arrival of suitable equipment. Failure to control temperature, particularly during centrifugation of extracts, has resulted in much lower yields of active antigen.

Tests of pigs prior to challenge with virulent virus have been extended to include more than 400 animals. These have continued to reveal close correlation between results of GDP test and challenge. Since the tissue culture neutralisation (TCN) test has been in use by C.S.I.R.O. officers at Parkville, some 250 sera have been examined in both tests. Again, there has been a close correlation between the two.

Pending delivery of preparative equipment for antigen extraction, attention has been directed to improved methods of visualisation of the test by producing dark field illumination for a shadowgraph and by the staining of tests.

Specificity of GDP Test Investigated.—This has been done by examining the role of cattle in natural transmission of low virulence swine fever virus and their ability to develop serological responses. Efforts to recover a bovine agent with which to conduct complementary experiments have been unsuccessful. To date, there is no evidence of non-specificity of the test when applied to pigs.

Histopathology.—Histopathological examination of pigs brains has continued, in any mortalities suspicious of swine fever, as a guide to where more intensive diagnostic techniques should be applied. Brains from 575 pigs were examined this year, and changes typical of swine fever were present in only

three brains (about 0.5 per cent). Changes suggestive or suspicious of swine fever were present in a further 21 pigs (3.6 per cent). This contrasted with findings in the previous year, when, in 1002 brains examined, 12.8 per cent showed either typical or suspicious lesions of swine fever. In the current year, seven cases showed lesions consistent with salt poisoning while 18 brains showed a bacterial encephalitis and/or meningitis.

Viability of Virus in Pig Products.—Investigation of viability of virulent swine fever virus in sausage casings, ham and processed canned hams continued.

Results with sausage casings this year were not in agreement with those presented in the last report, probably because other methods of preparation were used. Commercial processes for casing-production vary greatly between commercial firms. Virus was demonstrated on fresh unsalted casings up to at least 72 hours. After this, this type of casing would not be used. The virus was proved present in salted casings after three days, eight days, 16 days and 30 days storage at 40°F. The work is continuing.

The first trial on virus viability in mild cured ham showed it able to survive for at least 85 days. In a second trial the virus has survived for at least 34 days. Feeding trials will be continued.

In initial work with heated hams the virus was destroyed in 1 lb. cans by heating at 180°F for 50, 75 or 100 minutes. Further trials have now been completed with ham in 6-7 lb. cans and the virus has been killed after exposure of these at 180°F for 185 minutes and for 160 minutes. As 180°F for 75 minutes for the 1 lb. cans, and 180°F for 185 minutes for the 6 lb. cans appear to be minimum requirements for commercial processing, canned pig meats seem not to be a swine fever risk.

LD 50 of Virulent and Low Virulent Virus Compared.—The LD 50 of the introduced virulent strain of swine fever virus has been determined as 1 ml of infected blood diluted 1 in 10,000,000. An attempt to determine the LD 50 of the N.S.W. strain of virus was somewhat inconclusive because of too few pigs in the trial, but it appeared to be in the range of 1 ml of blood diluted 1 in 10 or 1 in 500.

An interesting result of this work was demonstration of low infectivity of the N.S.W. virus. This could explain the low morbidity and low mortality rates within many infected herds on the field.

Virus and Disease Spread in Herds with Detected GDPT Reactors.—Three herds are under close observation. In one, all gel test reactors are removed. In a second, gel test reactors are allowed to remain in the herd with normal management practices. In a third, reactors and non-reactors are maintained on intimate contact and allowed to farrow and suckle their progeny in the one closely confined group. Observations on these three herds include regular serological examination and an attempt to recover virus from any sick or dead pigs within the groups.

General Remarks.—A total of 386 pigs passed through the infective pens this year and most of these were under close observation, including twice-daily temperature charts. Eighty-five of these were from the fever free herd at Hawkesbury College and were used for transmission trials and experimental work. The remaining 301 were gel test reactors brought to the laboratory for challenge, or members of condemned herds brought to Glenfield Station for infection with virulent virus and subsequent collection of pancreases for antigen production. Four separate virus strains have been under examination, namely the N.S.W. strain, the virulent Weybridge strain, the Cornell strain, and a viability test on the old 1945 N.S.W. strain. With credit, the professional staff and animal attendants have handled without any cross or accidental infection this large number of pigs in the 20 isolation pens available.

The general New South Wales position as far as Swine Fever outbreaks are concerned is indicated by the facts that no herd has been slaughtered-out since November 1962; only two properties have been under suspicion in the last six months, and no filterable agent in material from sick or dead animals has been demonstrable in either herd.

How long this favourable position might continue may not be forecasted, because about 7 per cent of gel reactors are present in sampled pigs going through the various abattoirs. It is not known what if any proportion of these reactors are actual carriers of the virus, and a detailed examination of a limited number of reactors is being undertaken. It is not unreasonable to assume that a virus of low virulence and low infectivity might be introduced to a herd, sensitize some of the pigs, and then die out completely, or remain to continue to sensitize a few animals without producing any noticeable morbidity or mortality.

Liver Copper Levels in Pigs

Inadequacy of recorded data on copper content of pig tissues prompted analysis of samples of livers from young Hawkesbury College pigs. To date, 44 samples have been analysed. These have revealed liver levels of 120-200 ppm at birth, falling to about 20 ppm at 12 weeks of age.

POULTRY WORK, VETERINARY STATION, GLENFIELD

Leucosis.—This has remained the most common disease of the industry. Its incidence was even higher than in previous years. Neural lymphomatosis has increased, and caused considerable losses in the broiler industry in particular.

The broiler industry basically depends on highly selective strains genetically developed for rapid growth rate and food conversion efficiency. It seems possible that a genetic factor of lower resistance towards this disease may have been introduced. The earliest cases of Leucosis appeared at age four weeks.

This year the first case of visceral lymphomatosis in turkeys was recorded.

Avian Monocytosis.—This disease appeared to be minor in the second half of 1962 but incidence has increased considerably in 1963. It became serious in many flocks. Highest incidence was amongst broiler flocks aged 4-7 weeks.

The disease is frequently associated with respiratory symptoms suggested by recent research to be caused by an infectious bronchitis-like virus. With this possible aetiology the spread of the disease is understandable. Treatment with potassium citrate is still considered the most effective control or prevention method.

Infectious Laryngo-tracheitis.—This remained limited to enzootic areas, and incidence was about the same as in the previous year.

The classical form of ILT associated with haemorrhagic tracheitis is gradually diminishing in frequency but a new type of ILT which causes little mortality and usually terminates in recovery after 10-14 days is replacing it. In transmission experiments the virus can only occasionally be isolated from eye discharge and the trachea. However, in other cases transmission into susceptible birds via the trachea has resulted in typical form of haemorrhagic ILT. These observations lead to a speculation that either the previous highly pathogenic virus sometimes reverts to a less virulent type of virus or that a completely new ILT virus has spread through N.S.W.

The bird overcoming the ocular infection remains resistant to reinfection with virulent strain of ILT if challenged via the trachea. Some farmers make use of the qualities of this new virus by exposing the young chickens to infection spread by an already clinically affected bird. Following recovery of the young flock affected with this mild form, farmers claim that ILT outbreaks do not subsequently occur.

Coccidiosis.—As in previous years this remained a minor problem. Coccidiostats are a routine inclusion in most poultry mash. Even so, outbreaks have been frequent in periods of continued rain. Sulquinoxaline or toltrix have in general successfully controlled such outbreaks.

In most of these outbreaks, new clinical symptomatology was observed. It is characterised by wasting in spite of good appetite. At post mortem, a moderate enteritis has been observed in the small intestines. Intestinal smears have revealed small type schizonts and only few small type oocysts. Identification of these organisms has not been completed but *Eimeria acervulina* or *brunetti* are suspected.

Pullorum Disease.—Only sporadic outbreaks were recorded. In most cases only a single hatchery was involved, supplying a faulty hatch of chickens to various poultry farmers. In only one case was a hatchery involved in repeated outbreaks.

A diagnostic problem occurred in the laboratory, with birds showing typical lesions at post mortem but negative on bacteriological examination. Further investigations revealed that in some cases the organism may only be isolated from the necrotic lesion itself and not from the blood or liver.

Similar diagnostic difficulties occurred in birds previously treated with furazolidone, as day olds, but dying at the age of three weeks with lesions of pullorum and with positive agglutination reactions.

Pullorum infection was generally confined to young chickens but one case of heavy mortality occurred in adult layers. Symptomatology and pathology of this case suggested *Salmonella gallinarum* infection, but the laboratory test excluded these organisms and confirmed *Salmonella pullorum*. Rapid spread of disease in this flock seemed due to heavily contaminated litter. Examination of rats infesting these premises failed to demonstrate *Salmonella pullorum*.

Chronic Respiratory Disease.—This increased by comparison with the previous year. The disease was more frequently in typical form showing cheesy air sacculitis and mucoid tracheitis. *Mycoplasma gallisepticum* was isolated in many instances, sometimes complicated with coli infection or staphylococci. Treatment with antibiotics in the feed has not proved successful. Streptomycin injection of birds in the early stages of disease has appeared more promising although not always permanent.

Fowl Cholera.—This was more common in 1962 than in 1963. In most cases *Pasturella avisepticum* was isolated, although sometimes a variant of maltose fermenting strain was involved. This resisted sulphaquinoxaline treatment. In view of this observation some commercial firms have shown interest in production of a bacterin vaccine. It is not yet available.

Fowl Pox.—It caused heavy loss of young birds, particularly in the broiler industry, and appeared predominantly in feather-picking flocks.

Some cases were ocular and respiratory. The ocular and nasal discharge was similar to ILT or CRD and occasionally associated with slight gurgling. In these cases no evidence of feather picking or mosquitoes was demonstrable and speculation exists that fowl pox virus may be spread in the air. On some occasions the ocular and respiratory form of fowl pox was associated with ILT and CRD.

Omphalitis.—Incidence of omphalitis amongst hatcheries declined. This was ascribed to increased attention to incubator hygiene.

Staphylococcosis.—Typical forms of staphylococcosis continued to be common in commercial flocks. In some severe outbreaks, a septicæmic form of staphylococcosis was observed. There was sudden mortality, without the usual lesions. No successful treatment is yet available.

Blackhead (?).—Interesting cases presented for examination during the year included birds with symptoms and lesions indistinguishable from blackhead but from which histomonads could not be demonstrated. Bacteriologically, *Proteus* organisms were consistently isolated from these lesions. The exact aetiology has not been determined.

Suspected Infectious Bronchitis of Fowls.—A number of outbreaks of a respiratory condition were investigated by the University of New England and Glenfield Station. A virus isolated from the outbreaks has produced dwarfing and curling of chick embryos consistent with the effects of infectious bronchitis virus. Paired sera submitted to overseas laboratories by the two institutions have given inconsistent results but it seems probable that at least two strains of bronchitis virus are present in N.S.W. One appears to be primary cause of a comparatively mild respiratory condition in young chicks which may be more important if in association with mycoplasma infection. Plans have been made to evaluate a locally produced vaccine. The other nephrosus strain appears to be more virulent.

The disease has been confirmed or suspected in many flocks widely separated in N.S.W. The disease may have been present but unrecognised in this State for some years.

Examination of Pullorum Antigens.—A breakdown in pullorum-tested flocks on a few properties required detailed examination of stained pullorum antigens. The results of rapid slide tests with three stained commercial antigens are being compared with tube tests using antigens prepared from similar and other strains of pullorum. These comparative tests are being examined with negative sera and with sera from birds artificially infected with *Salmonella pullorum* at different dose rates. This work is not yet complete but indicates that the rapid test is less sensitive and detects 80 per cent or more of the birds reacting to the tube test.

Infectious Laryngotracheitis Vaccines.—In co-operative work with the University of Sydney and the National Biological Standards Laboratory strains of ILT virus are being examined for suitability for preparation of vaccines.

The reputedly low-virulence strain isolated in South Australia some years ago was found to be much more highly virulent when examined at Glenfield Station. When this virus was introduced intratracheally into healthy birds at dose rates varying between 1,000 and 1,000,000 pock-forming units, a mortality of 50 per cent was experienced. Its pathogenicity was comparable with that of the recognised virulent strain of virus from N.S.W. Infection via the conjunctival route resulted as expected in practically no mortality.

A strain of ILT virus introduced from New Zealand was found to be much less virulent. There was less than 2 per cent mortality when it was introduced intratracheally at similar dose rates.

Initial challenge trials with surviving birds from both these groups, challenging with the virulent N.S.W. virus, revealed the birds to be solidly immune. Thus all strains of ILT virus so far examined appeared to be antigenically identical.

Further work with the New Zealand strain virus is in progress or planned to: (i) compare pock and plaque lesions with those of other strains; (ii) determine age and breed susceptibility; (iii) determine any increase of virulence with rapid passage through the most susceptible type of birds; (iv) determine the dose response curve for various routes of infection; and (v) to determine the biological efficiency as an immunizing vaccine.

Depending on the results of that work, the low-virulence strain might be used for preparation of all commercial vaccines for this State.

POULTRY RESEARCH, SEVEN HILLS

Poultry Nutrition Research

Meatmeal Research Accommodation, by Donation.—Following donation of almost £2,000 by interested meatmeal manufacturers, stockfeed manufacturers and interested individuals, a special air-conditioned building has been completed to house chickens for the biological testing of the meatmeal.

Meatmeal Research Intensified.—The most significant activity this year has been intensification of research into the use of meatmeal in poultry diets and the causes of variation in feeding value. An analyst has been appointed specifically to concentrate on this investigation.

Choline in Chicken Diets.—In 1953 an experiment at this Station showed that choline supplementation of the diets then in use did not improve chicken growth or feed conversion, and in some circumstances could reduce growth. Later changes in types of diet together with considerations of reported chicken requirements and calculated choline contents of the diets, have led to the use of choline in broiler diets, despite the earlier doubt as to its value.

Three recent experiments have confirmed the earlier conclusion that choline is not deficient in a typical, in-practice broiler diet, and in one of the experiments depressed growth was associated with choline supplementation.

Analysis of the diets used in these experiments established that the choline content is about 350 mg/lb., compared with an estimated chicken requirement of 600 mg/lb. Factors responsible for the discrepancy between the actual choline content of this diet demonstrated by chick growth assay to be adequate, and the accepted requirement of the chicks, are being investigated.

Laying Hen Nutrition Experiment.—Forty-eight groups of pullets are being fed six different diets, to study the effect of riboflavin deficiency, methionine addition, complex vitamin supplement additions and bloodmeal. Results of the first three months of the trial indicate a response to riboflavin but not to methionine or the complex vitamin supplements. Blood meal is not increasing or decreasing egg production.

Genetics and Poultry Breeding Research

Breeding Programme (Eggs).—Three selection flocks, derived from Leghorn, Australorp or crossbred parent stock, have been selected for egg production for three generations. The fourth selection is in progress and matings will be made up during July, 1963. Stock from these flocks are used to produce chickens for layer hen experiments and are supplied to other institutions controlled by the Department of Agriculture.

Investigations into the efficiency of different selection procedures for egg production, the genetic control of egg quality and the genetic structure of different breeds are in progress in these flocks.

Breeding Programme (Meat).—Several flocks are being selected for weight gain to 10 weeks. These birds are used in chicken nutrition experiments when high growth rate is important. Studies on the biochemical factors in selection, the genetic control of feed efficiency and the pliotropic effects of rapid feathering, are in progress.

Egg Source for Incubation

Floor Eggs (?) or Nest Eggs for Breeding.—Sampling of floor and nest eggs laid in four blocks of pens involved in a nutrition experiment has shown that floor eggs have higher embryo mortality during incubation than do nest eggs.

The difference was assessed at 12 chickens per 100 eggs incubated. Also, although there was no difference in growth rate of the resulting chickens, there were considerably more early deaths among chickens from floor eggs. Gross examination suggested that most of the deaths of chickens from the floor eggs were due to omphalitis.

Egg quality also was examined, on a further sample of eggs from these pens. No clear difference in egg quality was detected, whether the eggs were fresh or stored.

An article with more complete details of this work has been prepared for *Poultry Notes*.

The Livestock Husbandry and Advisory Sections of Division of Animal Industry

These Sections, each controlled by a categorised Principal Livestock Officer, are: Sheep and Wool Section; Beef Cattle, Horses and Goats Section; Pig Section; Poultry Section; and Apiculture Section.

They provide the categorised District livestock officers for extension services and the livestock officers for husbandry of the Department's studs, herds, flocks at the Experiment Farms, Research Stations and Agricultural Colleges.

THE SHEEP AND WOOL SECTION

Staff Numbers.—Establishment increased to 37 officers, by appointment of three officers for the Fleece Measurement Service (see later). Eighteen are District Livestock Officers (Sheep & Wool). Finance for staffing new districts (Albury, Mudgee and Warren) approved by the Public Service Board in 1962 has not been available. These districts remain unstaffed.

Sheep and Wool Extension Services

Inter-year Comparison of the Major Extension Activities.—Overall the figures in the following tabulation indicate a steady increase of work. This is in part due to recently appointed officers becoming better known in their Districts. After appointment to a new District, a settling period occurs whilst officers become familiar with District conditions and known to producers. Moree and Brewarrina were the only Districts where a staff change occurred during the preceding year.

	1961-62	1962-63	Percentage Increase or Decrease
Number of property visits	2,810	2,939	+ 4.6
Number of sheep selected	391,646	361,790	— 7.6
Number of flock ewes fleece-weighed	57,062	66,894	+ 10.2
Value of sheep selected and purchased	£80,298	£132,002	+ 63.7
Lectures, demonstrations and field days	331	391	+ 17.5
Ram sales, Agricultural Shows, etc. ...	116	126	+ 8.6
Radio broadcasts, publicity statements	529	504	— 4.7
Competitions serviced	41	43	+ 17.0
Field Investigation projects	19	28	+ 47.3

Fleece Measurement Service.—This Departmental service financed by the Wool Industry Research Trust Fund commenced in February, 1963. The Service provides three officers specially trained for the duties. Results have been most satisfactory. The Service has been well received and is receiving the support of the stud industry.

Field Investigation Projects System.—The 1961-1962 field projects were analysed at Trangie Agricultural Research Station and showed that the results obtained on research stations are repeatable under commercial conditions.

A successful field day was held on a Merah North property, and representative sheep from the selection flocks at Trangie were taken there for demonstration and inspection. The Trangie Station's Special Research Officer addressed the field day on results from the Trangie flocks and application of this knowledge in a Merino breeding plan.

District officers are carrying out appropriate surveys to gather information on production trends, husbandry methods, and problems.

Merino Ewe Competition.—Alteration of this to a hogget competition is proposed and the conditions are being revised. This will make the competition more specialised. The competition, conducted in conjunction with "Country Life" newspaper, is popular and well supported.

Lamb Breeders' Ewe Fertility Competition.—Previously conducted as the Lamb Breeders' Ewe Competition in conjunction with the Rural Bank, the competition is now constituted so that judging can be carried out by measurement. The new competition will commence with the 1963 spring lambing.

Local Competitions.—District sheep and wool officers continued to be involved in judging various types of competitions run by local organisations.

In-service Training.—Four sheep and wool officers attended the Departmental Extension Methods School at Hawkesbury College, six attended the Commonwealth Sheep and Wool Extension Officers' Refresher Course, four attended the Departmental Farm Management Course, two attended the Special Irrigation School at Yanco Agricultural Research Station, and all officers attended the annual four days Seminar of the Sheep and Wool Section held at Hawkesbury Agricultural College.

Various officers undertook in-service training also by short-term assignment to specific institutions or districts, the periods of assignment ranging from a few days to a few weeks.

Sydney Sheep Show and Ram Sales.—Fifteen officers attended and acted as Stewards in the various Sections of the Show.

Sheep Industry Production Trends

Effect of Wool Values.—Wool values firmed and led to increased interest in Merino wethers. Some prime lamb producers purchased Merino wethers. There have been reports of some breeders swinging over completely to Merino wethers. This trend is not sufficiently general to markedly influence production.

Border Leicester Merino Ewes First Cross Breeders' Associations.—The breeding of first cross Border Leicester Merino ewes is gradually being organised by formation of first cross breeders' associations. These associations aim to promote the greater use of first cross ewes and to regulate values.

An offshoot of Narromine First Cross Breeders' Association is a company to export first cross Border Leicester Merino ewes to Mexico.

Breed Associations' Central Selling Points.—The breed associations are endeavouring to develop central selling points throughout the State, by organisation of sales promoted by the Australian Society of Breeders of British Sheep and the N.S.W. Merino Sheepbreeders' Association. They aim to eliminate small country sales where the class of ram is below standard and values consequently lower.

Spring Lambing.—This is now firmly established. There will always be some autumn lambings, due to various factors. These include marketing, management and grass seed problems.

Sheep Projects at Departmental Institutions

The sheep industry research at all Departmental properties is now supervised by research workers. Comments on various projects at these places have been presented by Trangie Agricultural Research Station under an earlier heading—"Trangie Station's Sheep Work With Other Experiment Farms and Stations".

The total number of sheep on Departmental Institutions at the 30th June, 1963, was 24,016.

THE BEEF CATTLE, HORSES AND GOATS SECTION

Special Extension Projects

Beef Cattle Schools.—In addition to many field days devoted wholly or in part to beef cattle subject matter, two Beef Cattle Schools were held; a five days' school at Yanco Agricultural Research Station in September and a five days' school at Bombala in November, 1962. A similar school planned for Casino early in 1963 failed to eventuate because of flood effect on farmer availability.

Beef Cattle Breeders' Competition.—For the eleventh successive year this competition held high interest and was supported by 201 entries. Many field days at locality, District and State judging levels helped to assure its extension value.

Beef Industry Investigational Work

Investigations into beef cattle problems were continued at Leeton Agricultural Research Station by a Special Veterinary Research Officer (Beef Cattle). A second research officer has been appointed to assist in this work. There is an account of what is proceeding there under an earlier heading—"Beef Cattle Research, Leeton Station". The material under "Cattle Research, Veterinary Station, Glenfield" is also relevant.

The Australian Cattle and Beef Research Committee has approved eight projects to be carried out in New South Wales. Two, namely "Pasture Intake and Digestibility Studies—Production of more beef per acre", and "Beef Cattle Improvement through Breeding Methods", are responsibilities of the Division of Animal Industry and involve officers of this Beef Cattle, Horses and Goats Section. Both projects are under way.

Stud Beef Cattle

Numbers.—Departmental stud beef cattle are located at Hawkesbury Agricultural College (Poll Herefords), Wagga Agricultural College (Poll Shorthorns), Leeton Agricultural Research Station, Trangie Agricultural Research Station, and Duck Creek Sub Station (Angus). The stud beef cattle numbers decreased this year from 572 to 546. Sixteen stud bulls were sold for a total of £4,614 15s. 0d.

Competitive Exhibits.—Six Angus bulls from Trangie were exhibited by the Department at the 1963 Sydney Royal Show. They gained a Third and two Fourth prizes. Two Poll Shorthorn bulls were exhibited from Wagga Agricultural College. One of these gained a First prize and Reserve Junior Championship and the other a Fourth prize.

The Angus stud at Trangie Agricultural Research Station has been allocated to the research project "Beef Cattle Improvement by Breeding Methods" referred to earlier.

Department's Commercial Beef Cattle

The total of commercial beef cattle owned by the Department decreased from 821 to 799. Two Angus steers from Trangie A.R.S. were exhibited at the 1963 Sydney Royal Show. One of these was placed First "on the hoof" in its class and the other Third "on the hook" in its class. Three hundred and seventeen head were sold for a total of £8,946.

Horses

Numbers.—The number of horses owned by the Department decreased from 231 to 225. Twenty-one were sold for £2,174.

Service to Private Mares.—Nineteen privately-owned mares were accepted for service by Departmental Arab stallions as follows: Razaz (imp.) nine, Sala (imp.) five, Babylon, five.

The stallion Spindrift (imp.), on loan to the Department, served nineteen privately-owned mares.

Competitive Exhibits.—At the 1963 Sydney Royal Show the Department exhibited nine Arab horses; a colt and four mares from Wagga Agricultural College, a stallion and three mares from Hawkesbury Agricultural College. These gained one Championship, one Reserve Championship, two First prizes, two Second prizes and one Third prize. The champion mare, Sphynx, which was actually a filly, three-year-old, won the coveted Lady Wentworth Memorial Shield.

THE PIG SECTION

Staff.—One livestock officer was appointed to fill the vacant position carried over from last year. The Senior livestock officer was brought from Lismore to head office for relieving duties in the absence of the Principal Livestock officer who was on extended sick leave. The present staff comprises the Principal, five Senior livestock officers, and seven livestock officers. No position is vacant.

Industry Trend.—There was a substantial decline in pig raising activities in this State. Many pig raisers have left the industry and others have reduced their breeding herds. The statistics available at 31st March, 1963, indicate the trend:—

	1962	1963		
No. of holdings carrying pigs	14,548	11,176	down	2,779
Breedings sows ...	68,610	57,344	down	11,266
Total pig population	471,000	392,000	down	79,000

Arising from Swine Compensation Act.—Twenty-six pig herds condemned for swine fever were valued for compensation purposes, and help was given in the preparation and examination of many claims in respect of suspect pigs ordered for destruction.

Arising from Swine Branding Act.—The check branding campaign under the Swine Branding Act continued to assist in identifying farms of origin and to improve the implementation of the Act. Court proceedings were successfully undertaken in a number of cases.

Departmental Herds.—Large White, Berkshire, Tamworth and Landrace pig herds were maintained at Hawkesbury College, Wagga College, Wollongbar Agricultural Research Station and Grafton Experiment Farm. The Hawkesbury and Wagga herds were used mainly for student instruction and ration purposes. The Wagga herd was also used for disease research, while the Wollongbar and Grafton herds were used for nutrition research. The Hawkesbury herd also provided sixty-seven pigs for swine fever research.

A total of 1,046 pigs were disposed of by sale or for student rations at the Colleges or for research. Sale of stud stock remained low—due mainly to the swine fever restrictions. The number of pigs used for research increased.

Pig Disposals	1959-60	1960-61	1961-62	1962-63
Stud pigs sold	190	64	8	23
Market pigs sold	416	414	423	418
Pigs killed for food	298	401	319	483
Pigs killed for research			127	122
Total pigs disposed of	904	879	877	1,046
Approximate value	£13,000	£10,000	£7,000	£10,581

Extension (and Regulatory) Services.—The activities of livestock officers in carrying out extension and regulatory duties in the pig industry are shown in the following table:—

	1959-60	1960-61	1961-62	1962-63
Farms visited	1,397	1,471	1,299	1,188
Meetings attended	62	85	63	38
Pig Sales attended	139	147	242	165
Field Days attended	61	51	35	21
Bacon Factories, Abattoirs visited ..	79	97	199	102
Experiment Farms visited	147	131	106	55
Shows attended	26	29	17	12
Lectures and Demonstrations given ..	108	148	72	73
Broadcasts	75	93	60	56
Swine Branding Act (1940) inspections	30	37	247	79
Herd Valuations	..	..	79	26
Stock Food and Medicines Act (1940) inspections	..	..	13	13

Also, a great volume of requests for advice on pig production were dealt with by in-person interviews, letter and telephone. A comprehensive range of printed pamphlets on breeding, feeding, management, housing and marketing of pigs was also widely distributed.

Daily and weekly newspapers were supplied with numerous press releases.

Assistance to Other Departments and Organisations.—Technical advice was given on management of pig herds at institutions controlled by the Department of Prisons, Health, Education and Child Welfare. Breeding stock was supplied as required. The Department of Technical Education was also provided with Correspondence teaching and Part-Time Teachers and Examiners.

Services of the livestock officers were called upon by many farmers' organisations, the Junior Farmer Club movement, the Australian Pig Society, the Royal Agricultural Society of New South Wales and numerous country Agricultural Show Societies, the Australian Meat Board, the Rural Bank of New South Wales and Commonwealth Development Banks. The livestock officers also assisted in emergency flood relief duties on the north coast.

THE POULTRY SECTION

Industry Trends.—Egg production declined by about six million dozen and was 10 per cent lower than in 1961-62. Egg supplies could barely meet the full demand towards the twelve months. Laying flock numbers were lower than during the previous year, but supply was reduced more so by abnormally wet weather in the main production districts. For the first time in five years, weekly receipts at the Egg Marketing Board were short of demand throughout the whole year. There is no reason to doubt that egg producers will quickly respond to the marketing conditions which prevailed this year.

The most significant trend in the egg industry is the decrease in number of medium sized commercial farms, farms keeping from one to two thousand layers. On the other hand there is an overall increase in flock size of the larger, more specialised producers.

The following figures taken from flock registrations compiled by the Egg Marketing Board indicate that more than 60 per cent of the commercial egg production is from producers keeping over 2,000 layers.

Size of Flock	No. of Flocks		Total No. of Laying Stock	
	May, 1962	May, 1963	May, 1962	May, 1963
75 — 500	6,087	6,507	Thousands 642	Thousands 568
501 — 1,000	765	619	533	406
1,001 — 2,000	780	673	1,066	869
2,001 — 5,000	619	596	1,639	1,503
5,001 — 10,000	116	144	608	709
Over 10,000	41	41	532	607

Broiler growing is now an important section of the poultry industry. Some 14 million broilers were raised this year, mostly by specialists raising the birds under contract to large, recently established processors.

Broiler growing has greatly increased the hatchery trade. Sales of meat-strain chickens far exceeded the numbers of pullets hatched for laying flock replacements.

Improved quality and growth rate of the readily obtainable meat-strain chickens is indicated by the results of random-sample broiler tests conducted at Hawkesbury Agricultural College during the year:—

Period	Duration of Test	Average Weight per Broiler	Food Consumption per lb. of Broiler
	weeks	lb.	lb.
June-August, 1962	10	3.22	2.8
February-April, 1963	9	2.6	2.9
May-July, 1963	9	2.92	2.7

National Poultry Exhibition.—A poultry exhibition depicting all aspects of production was staged in conjunction with the XIIth World's Poultry Congress, Sydney, in August, 1962, attended by 1,500 delegates from forty countries and thousands of visitors. The educational value of the exhibition received consistently favourable comment.

Extension Services.—Monthly *Poultry Notes* dealing with topical subjects on husbandry, disease control and research findings were published until April, 1963. In future the Notes will be published quarterly, commencing in July, 1963.

An experienced poultry officer has been appointed to Gosford and Mid-Coast and Hunter Region. His headquarters are at Gosford. There are more than 1,500 commercial egg and poultry meat producers in his territory.

The following summary relates to advisory and allied duties by poultry livestock officers during the year:—

Visits to private farms	1,954
Field days	15
Poultry schools	1
Visits to government institutions	49
Broadcasts	53
Attendances at meetings	90
Lectures and symposia	34
Press statements	87

The 12th annual turkey raisers' school and convention was held at Wagga Agricultural College with an attendance of fifty.

THE APICULTURE SECTION

Staff.—The sectional staff currently comprises five officers; the Principal and four livestock officers (apiculture).

Industry Trends.—Honey production at most centres was below average for quantity. Full advantage of honey flow was not taken. Low prices, until early 1963, led beekeepers to curtail expenditure. To keep costs down, they were reluctant to move their hives.

Demand for honey remained poor during the first half of the year then demand greatly increased. Within a few months the market situation went from most depressed to strong demand and the highest prices on record. All major honey exporting countries had experienced poor seasons. Australia rates third amongst the honey exporting countries and from 3rd to 5th in the honey producing countries. New South Wales produces some 40 per cent of the Australian total.

Bee Diseases.—Incidence of American Foul Brood disease was light. Occurrences were brought under control before many hives were involved. *Nosema* disease was of minor importance. Losses due to Sac Brood disease were negligible.

Many queen bees were received from overseas, particularly from the U.S.A., and some from New Zealand and Yugoslavia. A number of queen bees were ordered to be destroyed by quarantine authorities because of the presence of mites. The Quarantine Act defines the condition as "Acariasis" and does not distinguish between internal and external mites. Internal mites are the cause of Isle-of-Wight disease. The external mites are usually considered to be harmless and are present in all major bee-keeping countries of the world.

A survey was conducted to determine the presence of external mites on local bees. External mites were found on most samples. These came from an area extending from Wagga to Tamworth, and coastal as well as inland. Similar mites are reported to be on bees in most apiaries in other States.

No internal mites were however found on local bees.

Extension Services.—The section concentrated on group extension methods, through lectures and demonstrations at meetings or field days. Very successful regional beekeeping schools were conducted, as well as the annual school at Hawkesbury Agricultural College for beekeepers. Livestock officers (apiculture) were active also in extension by means of radio, press copy, publications and T.V.

A comprehensive collection of black and white colour photographs on beekeeping subjects and honey and pollen flora is being accumulated for publications and lecture aids uses.

Plastic queen-cell cups designed by the Principal apicultural officer are now in general use, and proving more satisfactory than the former waxen cups. These were featured by the December, 1962, issue of the *Agricultural Gazette of N.S.W.* They have created considerable interest in major honey producing and exporting countries overseas, particularly the United States, Mexico and New Zealand.

Regulatory and Allied Services

DISEASE INCIDENCES AND ACTIONS

Anthrax

Thirty outbreaks occurred. Control involved vaccination of in-contact sheep, and quarantine. In most cases mortalities had not progressed far before being checked by vaccination, but on some Western Division properties where supervision of stock is difficult there were considerable losses. On two holdings deaths approximated 200 head, while on one property 400 of 1,250 sheep were lost.

All outbreaks were in the recognised anthrax belt; except one at Cowra where one sheep and five pigs died.

In summary, the 30 outbreaks comprised one in the Central West, six in the South West, 14 in the West, and nine in the Western Division, and they involved 1,967 cattle, 63,929 sheep and 216 pigs. The mortalities amounted to 188 cattle, 1,510 sheep and 16 pigs.

The policy was adopted of placing in quarantine during the summer months all stock routes and reserves on which mortalities from anthrax have taken place during the preceding five years. Nineteen such routes and reserves were quarantined. Their use was confined to vaccinated stock or stock conveyed by motor vehicles.

Brucellosis

Bovine Brucellosis.—The disease is enzootic throughout the State, with greatest incidence in dairy cattle. There is no official control but vaccination with strain 19 by practising veterinarians is recommended. During the year a publicity campaign to induce more widespread use of this vaccine was commenced.

A number of reported cases of undulant fever due, in humans, to *Brucella abortus* were followed up. Source of infection was ascertained and advice given to the owners of the cattle.

The Brucellosis-free Herd Scheme was maintained and during the year 14 herds listed under the scheme were tested; 743 cattle were tested with negative results.

Considerable testing for diagnostic purposes and in connection with export of cattle was carried out; 3,871 agglutination tests were done and yielded 687 positive reactions and 117 doubtful reactions.

Ovine Brucellosis.—This disease was increasingly diagnosed, particularly in the Dorset Horn breed. There was less in other British breeds and still less in Merinos. Although there was low incidence in the latter breed, cases of a high level of infection were found in certain studs.

Complement fixation testing for diagnostic purposes was carried out; 5,959 serum samples tested yielded 1,207 positive and 238 doubtful.

The favoured control method aims at ultimate eradication from individual flocks by early weaning and segregation of ram lambs. However, in many instances vaccination with a combination of strain 19 and the adjuvant *Brucella ovis* vaccine is performed.

Segregation appeared to give satisfactory results where efficiently practised but in one flock from which the disease appeared to have been eradicated subsequent testing revealed high incidence of reactors. The infection source was not determined.

Porcine Brucellosis.—No outbreak was detected but one large piggery where infection had been found in the preceding year was maintained in quarantine. It was subsequently released, after all stock above weaning age had returned two negative reactions.

The Brucellosis-free Herd Scheme was maintained but, because of past experience with non-specific reactions, entry of herds into the scheme was not encouraged. Testing of 186 pigs in nine herds was done under the scheme. All reactions were negative. A further 747 serum samples were tested for diagnostic purposes, and there were three positive and one doubtful. The reactors were in the infected herd referred to in the previous paragraph.

Sheep External Parasites

Official control of sheep lice and ked was maintained. Infested properties were placed under quarantine until all sheep thereon had been satisfactorily treated. The following are particulars of holdings and sheep so dealt with:—

Administrative District	Lice Infestation		Ked Infestation		Ked and Lice	
	Holdings	Sheep	Holdings	Sheep	Holdings	Sheep
Central	26	20,463	..	..	..	..
Central West	96	60,804	11	14,527	9	15,883
Cumberland	2	147	..	..	..	..
North	116	151,397	21	33,370	10	5,639
North East	..	..	..	..	..	..
North West	80	139,607	1	1,150	..	..
South	122	76,886	..	..	..	..
South East	31	33,012	11	12,300	24	31,951
South West	194	103,286	..	..	..	..
West	51	52,125	..	..	..	..
Western Division ..	19	95,932	..	..	..	..
Total	737	733,659	44	61,347	43	53,473

Sheep Footrot

There was less than in the previous year, mainly because in the southern areas, where the disease is enzootic, seasonal conditions did not generally favour outbreaks.

The only area where the disease is officially controlled is the Armidale quarantine area. Here, nine holdings were known to be infected at the commencement of the year, and another nine outbreaks occurred during the year. Infection was eliminated from seven flocks, leaving 11 still affected at the end of the year. In this part of the State seasonal conditions favoured spread. Among the affected properties are several very large ones where eradication is attended by many difficulties.

Johne's Disease

An outbreak occurred at the end of the year. The diagnosis was only made in the case of one animal but there was a history of previous losses after suspicious symptoms. Source of infection was not determined but a number of cattle had been introduced from properties where there had been stock imported from overseas.

Quarantine restrictions were removed from a holding on which the disease had been found during the previous year. Surveillance was maintained over 15 holdings previously in quarantine or which had purchased cattle from properties subsequently found infected.

Pleuropneumonia Contagiosa

No outbreak was recorded. Queensland cattle entering this State were kept under surveillance as far as possible and subject to inspection. The State's two protected areas against this disease were maintained with restrictions on entry of cattle.

Poultry Pullorum Disease

Stock Diseases Act regulations introduced three years ago require annual testing of all breeding flocks from which hatching eggs or chickens under 21 days of age are sold. In cases where reactors exceed two per cent, a retest within 35 days is required.

In addition to compulsory testing, the voluntary Pullorum Accredited Scheme, with three classifications of freedom from the disease, was maintained.

Testing in both categories involved 191 flocks comprising 536,968 birds and led to the discovery of 2,878 reactors, equivalent to 0.53 per cent of birds tested. Approximately 10 per cent fewer birds were tested, compared to last year, but incidence of reactors increased from 0.3 per cent to 0.53 per cent. This increase was due largely to one farm where 673 positive reactors were discovered, some 24 per cent of all reactors discovered.

Of the 191 flocks tested, 83 were in the Accredited Scheme and comprised 314,731 birds tested; for 299 reactors.

Trichomoniasis in Cattle

Three cases were detected. The properties were placed in quarantine. Four holdings where the disease had been previously diagnosed were freed from restrictions. At the end of the year 12 holdings were in quarantine.

One of the properties where the disease was diagnosed during the year was a large beef-raising holding. Source of infection was not determined but the holding adjoined a stock reserve from which strayed cattle from time to time enter. The herd had not been experiencing a significant decline in fertility and the diagnosis was made fortuitously.

Fifteen bulls which had been used in the herd were tested and four found positive and slaughtered. Cows pregnant were kept for three months after calving before being mated to clean bulls, while those which had failed to become pregnant were consigned for slaughter. These measures are believed to have eradicated the disease.

Tuberculosis (Avian)

Sixty-one properties were in quarantine during 1962-63 because of avian tuberculosis. Most were pastoral holdings carrying few fowls. Departmental policy where outbreaks occur is to slaughter all poultry as soon as practicable, then continue quarantine for two years. During the quarantine no poultry is permitted except where special accommodation on new ground is provided and by permission of the Department. Testing of other stock may be ordered.

Tuberculosis (Bovine)

Control continued along the same lines as in recent years, viz:—

- Testing of cattle which supply raw milk for human consumption in the milk distributing districts established by the Milk Board under the Milk Act;
- Testing of cattle under the Tubercle-Free Herd Scheme;
- Testing of cattle supplying raw milk to rural urban areas, in tuberculosis-protected areas, quarantine areas (urban) or directly under the Local Government Scheme;
- Testing of cattle in eradication quarantine areas;
- Miscellaneous testing—cattle for export, compulsory cattle in contact with known infected animals, cattle purchased for soldier settlers and private voluntary testing.

Tuberculosis—Grand Totals of all Testing

Test	No. of Cattle Tested	No. of Reactors	Percentage of Reactors
Milk Board Scheme	9,984	8	0.08
Tubercle-Free Herd Scheme	9,892	7	0.07
Local Government Testing	9,960	11	0.1
Quarantine Area Eradication	341,380	2,603	0.76
Miscellaneous	79,485	1,782	2.25
Total	450,701	4,411	0.98

During the year an additional area (Armidale) was gazetted under the Milk Act with compulsory testing (under (a)) of herds supplying raw milk. Previously, testing in this area had been undertaken under the Local Government Scheme (c).

Present policy is to increase the number of eradication areas to the extent permitted by availability of veterinary personnel. Herds in individual areas are tested twice at annual intervals and if at the conclusion of the second series of tests tuberculosis is reduced to a level of 0.5 per cent or below, testing is carried out biennially. Areas which have completed two annual tests are East Casino, East Kempsey, Illawarra, Southgate, South Lismore and Woodburn. However, as the level of infection detected in the East Kempsey area during the second year of testing was 0.71 per cent, a further annual test of all herds therein is to be carried out.

Incidence of reactors detected in miscellaneous tests was slightly below the figure of 2.58 per cent for the previous year. Evidence of a high level of infection continued to appear in certain large beef herds located in western areas where annual rainfall and carrying capacity are low. Eradication of tuberculosis under these circumstances presents great difficulties because of the numbers involved, the problem of mustering

cattle for tests, and distance from headquarters of a veterinarian. On one such property, 269 reactors were detected in 939 cattle at an initial test; 28.7 per cent infection. Two further tests were undertaken during the year and at the third test there were 18 reactors in 678, or 2.7 per cent positive.

In one herd in a more closely settled area, a test revealed 187 reactors in 243 cattle. An unusual feature was that almost all the negative animals were in a group of heifers aged 15 to 30 months. There was evidence that feeding stalls had been initially responsible for spread of infection and that later the disease had been spread to young calves through infected milk.

Swine Fever

Extent.—Up to 30th June, 1962, 99 outbreaks had been recorded. Thirty-four of these were on properties outside the Sydney-Newcastle Quarantine Area. During 1962-63 positive diagnoses were made on a further 114 properties, making the total number involved 213. The number of infected properties located during this year in the Sydney-Newcastle Quarantine Area was 15, in the North Coast Protected Area 10, and in the General Quarantine Area 89.

Increased Trend to Lighter Mortalities.—Significantly the trend towards lighter mortalities observed towards the end of 1961-62 continued markedly. The trend became so obvious that the slaughter-out policy in force was amended.

Where no mortality was occurring on the piggery, despite presence of positive reactors to the gel test, found on survey, slaughter-out was not enforced. Such properties were held in quarantine, the positive reactors slaughtered, and if no significant mortality attributable to swine fever developed during the next six months the property was released. Pigs ready for market were allowed to proceed direct to abattoir for slaughter.

Cessation of Slaughtering-out.—Following this policy change (see preceding paragraph), the last piggery on which clinical evidence of swine fever was found was slaughtered-out in November, 1962.

Gel Test Less Specific.—The number of properties held in quarantine because of positive reactors to the gel test would be causing concern were it not that recent laboratory investigations reveal that the test is not as specific as was formerly thought to be so.

Amendments of Quarantine Areas.—It was obvious that occurrence of swine fever in the General Quarantine Area was just as prevalent as, if not more than that occurring in the Sydney-Newcastle Quarantine Area. The Sydney-Newcastle Quarantine Area was therefore cancelled, and the whole of New South Wales except the North Coast Protected Area was included in a new General Quarantine Area. This was necessary so that control over the boiling of food refuse being fed to pigs, and prohibition on the sale of store pigs, could be maintained.

At the same time, the North Coast Protected Area was modified by excluding the major portion of the Tenterfield Pastures Protection District from it. This was necessary to facilitate interstate transport of pigs and pigmeats.

Prohibition on Pig or Pigmeat Movements.—The stringent conditions applying to movement of pigs and pigmeats to the North Coast Protected Area, stepped up when the area was modified, included complete prohibition on movement of pigmeats and pigs from New South Wales or any part of Australia into the Area. Because of the relatively favourable situation which has now developed in the rest of the State, it is doubtful whether it will be possible to continue these restrictions unless further clinical outbreaks of swine fever are discovered in this State.

The really hopeful sign of success achieved in the eradication campaign to date is the overall general good health of pigs. There has been no significant evidence of mortality from swine fever since November, 1962.

ACTIONS UNDER STOCK FOODS AND MEDICINES ACT

Stock foods registered under the Act during the year totalled 1,606, and 214 wholesale dealers were involved. The number registered was slightly less than in the previous year.

Regulations which had hitherto prohibited the level of urea in a stock food or lick from exceeding 3 per cent were amended to provide that stock licks formed by heat fusion into a solid mass may contain up to 45 per cent urea.

The Stock Medicines Board granted registration to 1,660 therapeutic and prophylactic agents. Two products were refused registration. Thirty-nine applications for registration were withdrawn.

Following agreement between the Commonwealth and State authorities to limit the external application of chlorinated hydrocarbons to sheep and cattle, because of toxic residues in the fat of animals so treated, the Stock Medicines Board refused as from the commencement of the current year, to consider applications for registration of such insecticides.

For human health reasons the Board also decided against registration of oestrogens for growth promotion or caponising purposes. Use of these hormones by veterinarians as therapeutic agents was not affected by the Board's decision.

ACTIONS UNDER CATTLE COMPENSATION ACT

Claims and Payments.—Some 9,060 claims were dealt with, involving 14,100 animals. Compensation payments amounted to £231,759 1s. 9d. Compared with the previous year's figures there were 2,312 more claims and 2,407 more animals, and an increase of £55,765 18s. 3d. in compensation payments.

Diseases Concerned.—Diseases for which compensation was paid were as follow:—tuberculosis, 6,323 cattle; cancer, 4,912; actinomycosis, 1,843; actinobacillosis, 1,007; pleuropneumonia contagiosa, 1; trichomoniasis, 1; and tick fever, 13; total, 14,100.

Claims Refused or Reduced.—Payment was refused in the case of claims as follows:—delayed notification of disease by owners, 142; failure of owners to notify disease, 7; failure to pay compensation levy, 12; delayed application for compensation, 26.

Payment was reduced in the case of 119 claims, where application for compensation was not made within 60 days of slaughter.

Continued Increase in Fund.—During each of the past five years there has been an increase in the credit balance of the Cattle Compensation Fund. The position of the Fund at the termination of each of these financial years has been as follows:—

	£	s.	d.
Balance as at 30th June, 1959	109,599	0	10
Balance as at 30th June, 1960	237,873	2	8
Balance as at 30th June, 1961	376,209	9	8
Balance as at 30th June, 1962	599,767	12	7
Balance as at 30th June, 1963	726,289	9	7

SERVICES UNDER COMMONWEALTH QUARANTINE ACT

The normal volume of work generally associated with the administration of the Commonwealth Quarantine Act, 1908-61 occurred, but with necessary greater attention to Port Hunter, Newcastle, and Port Kembla, and to Kingsford-Smith Aerodrome, Mascot.

Liaison with Customs Officers.—Good liaison and co-operation between the Department's Animal Quarantine Service and the Department of Customs and Excise and the Customs Agents continued. A senior officer of the Animal Quarantine Service addressed Customs Officers at a number of Customs Trainee Schools during the year, laying a foundation basic for their co-operation.

Animal Imports.—Imports of horses and cats from both New Zealand and the United Kingdom increased slightly. Dogs and bird imports decreased. Other importations were in similar numbers to those of the previous year.

Because of prohibition on transport of horses from the United Kingdom through the Suez Canal, and the cancelling of direct shipping service via South Africa, horses are now being transported via the Panama with a transshipment in New Zealand. The time of the journey has in most cases increased, primarily because of the need to tranship in New Zealand.



Veterinary Inspections Under the Quarantine Act

Imports of horses increased. Because of the prohibition on transport of horses from the U.K. through Suez Canal and cancellation of direct shipping via South Africa, they now come via the Panama with a transshipment in N.Z. Whether by air or sea, the imports are subject of rigid veterinary conditions.

Smuggling of birds from overseas ships again received attention, and several alleged cases were investigated in co-operation with officers of the Department of Customs and Excise. Cases of illegal entry of animals by air were also detected. The animals were destroyed.

Under the provisions of the Quarantine Act, 1908-61, the Commonwealth Minister for Health this year granted permission for importation of horses, dogs, cats and poultry by air vessel from New Zealand, subject to certain specific conditions. The main condition is that the air vessel concerned must be one which operated exclusively within Australia or New Zealand or within and between those two countries. This provision was included to reduce the risk of animals picking up infection from "unclean" aircraft operating to overseas countries. A number of horses have been imported from New Zealand by air. They have travelled well and been landed without incident.

Animal Products.—Importation of animal products continued to receive considerable attention in view of the various types and the volume imported. The quantities of each type imported were much the same as in 1961-62. Main exception was frozen or chilled meats from New Zealand. Volume of these far exceeded that imported during the previous year. The exceptional increase was, as far as could be ascertained, not due to any one cause. Different importers had different reasons for the importation. In addition, this year more pigmeats than previously were transhipped at Sydney from New Zealand to the Territory of Papua-New Guinea. This was due to the embargo placed on Australian pigmeats by the Territory authorities. Such transshipments were under quarantine control.

Large quantities of cheese from Europe, of wool from Pakistan, India and South Africa of a type not available in Australia for carpet manufacture, and of fishmeal from South Africa, Peru and New Zealand, were also imported.

Passengers' Luggage.—Co-operation continued between the Animal Quarantine Officers and Customs Officers in searching for illegal goods, baggage of passengers arriving by sea or air. Quantities of illegal goods such as salami, other meat products, home-made cheese, and certain Eastern foods seized were at least as great as in previous years.

One person who failed to declare any prohibited goods was found to have in his personal luggage 160 lb. of cheese, 40 lb. of tarahanas, a milk and egg product; 8 lb. of birds in oil; and an 8 lb. ham. This example shows that on many occasions no notice can be taken of the owner's declaration, and that a search must be made of all baggage.

Parcels Post.—The volume of goods, subject to quarantine control, arriving from overseas by Parcels Post continued to be considerable. The main seizures were from parcels addressed to private persons. Some of these consignees were rural people.

A number of trade samples were seized and subsequently released for analytical purposes under quarantine control. This action was taken so that local manufacturers may be in a position to keep abreast of overseas developments.

Ships' Pets.—Strict supervision of ships' pets on overseas vessels continued. This supervisory work was mainly in conjunction with other work on the waterfront.

Ships' Garbage.—Disposal of ships' garbage was subject of liaison between the Chief Quarantine Officers of the three Quarantine Services. Effective disposal of this garbage is a worrying problem for the Animal Quarantine Service.

MEAT INSPECTION SERVICES

Staff Increased.—The number of veterinary officers remained at two, brand boys at 17 and office assistants at two, but the number of meat inspectors increased from 148 to 165.

New Inspection Stations Staffed.—Staffing of Lachlan Valley County Abattoirs at Forbes, Berrima District Meats Ltd. at Moss Vale, and Griffith Abattoir Pty. Ltd., at Griffith commenced in April-May, 1963.

Volume of Inspections at Time of Slaughter.—The statistics for cattle, calves, pigs and sheep at the State Abattoir, in the County of Cumberland but excluding the State Abattoir, and at Country Abattoirs, and of horses at knackeries in the metropolitan area are shown in the following tabulation:—

	Cattle	Calves	Pigs	Sheep	Horses
State Abattoir	196,492	104,616	129,224	2,914,762	..
County of Cumberland (excluding State Abattoir) ..	52,924	27,987	23,326	1,166,560	..
Country Abattoirs	423,281	264,010	305,016	2,450,620	..
Knackeries in the Metropolitan Area	..	..	..	..	10 805
Totals	672,697	396,613	457,566	6,531,942	10,805

Condemnations.—"Total carcase" condemnations amounted to 0.606 per cent of the cattle, 0.245 per cent of the calves, 0.686 per cent of the pigs and 0.395 per cent of the sheep.

"Partial" condemnations affected 3.291 per cent of the cattle, 0.036 per cent of the calves, 2.599 per cent of the pigs and 0.441 per cent of the sheep.

Volume of Inspections of Meats Introduced into the Metropolitan Abattoir Area.—From places in New South Wales but outside the Metropolitan Abattoir Area, from New Zealand, and from interstate sources:—432,275 beef carcasses and 7,545,242 lb. beef in pieces, 315,946 veal carcasses and 396,709 lb. veal in pieces, 309,021 pork carcasses and 8,244,980 lb. pork in pieces, 1,775,387 mutton carcasses and 3,921,733 lb. mutton in pieces and 2,180 bacon sides and 670,034 lb. bacon pieces were inspected.

BOARD OF TICK CONTROL

Eradication Measures

Grafton Area.—A surveillance policy was maintained. All stock were examined prior to movement. All ticks found during these examinations and on stock slaughtered at the Abattoirs were identified either as *Haemaphysalis* or *Ixodes* species. There was no evidence of cattle tick (*Boophilus* species) in the area, so the Grafton Quarantine Area was released as from 30th June, 1963.

North East Maclean Area.—The fifteen month dipping programme, commenced in January, 1962, was completed on 13th March, 1963. In the period 1st July, 1962, to 30th March, 1963, a total of 24,846 stock were treated. During the dipping programme all unmusterable country had been patrolled regularly. No evidence of straying stock was detected. Subsequently a programme of examinations at twenty-one day intervals was commenced in May, 1963. This will continue for 12 months.

Currawinya.—That part of Rivertree Quarantine Area west of the Currawinya Quarantine Line, comprising about 13,000 acres, was re-gazetted as the Currawinya Quarantine Area. Approval was obtained to undertake an eradication programme in it. The whole area was considered unmusterable and it was therefore necessary to lease the properties and remove all the stock. This work was completed by 1st February, 1963. The area has since been regularly patrolled and is being kept free of stock.

Rivertree Quarantine Area.—During 1962-63 a new southern boundary was selected and fenced. This was completed by 17th October, 1962. It placed all known infested properties within the Tabulam Quarantine Area. Subsequently, examinations at twenty-one day intervals were done from 1st January to 31st May, 1963. About 95 per cent of the cattle were regularly examined. No evidence of cattle tick was found. It may be possible to release this area after further examinations.

Copmanhurst.—A policy of twenty-one day examinations was carried out. An average of 61,000 cattle was examined on each round. No cattle tick was detected. All moving stock were examined and treated.

Tick Fever

The situation remained very satisfactory. Only one outbreak occurred, the second outbreak within the last three years. A veterinary Practitioner diagnosed a suspected case on a property at Doubtful Creek in the Casino Section of the Richmond Quarantine Area in December, 1962. Examination of smears at the Veterinary Research Station, Glenfield, confirmed the presence of *B. argentina*. The usual control measures were implemented.

Techniques developed by the C.S.I.R.O. were used to determine the incidence of carriers on this property. In addition to the control measures on the property, thick blood films are being collected from all cattle on all holdings adjoining the affected property in an attempt to trace the cause of the outbreak.

Control was maintained on the Piggabeen property involved in an outbreak in June, 1962. Use of thick blood films and the Complement Fixation test detected three *B. bigemina* carriers, subsequently confirmed by calf inoculation trials.

All cattle over the age of five months on three holdings that had been involved in outbreaks some three years previously, were bled. The sera was submitted to the C.S.I.R.O. for the Complement Fixation test. All results were negative. The holdings were released from quarantine.

Detection of Cattle Tick in Clean Country

On 15th January, 1963, stock entering the Tick Quarantine Area at Ti-Tree Gate were examined and one animal carried a single fully engorged female (*Boophilus* sp.) tick. The animal was from Drake. All other cattle in the paddock from which this animal had come were examined. No further tick was found. Quarantine was imposed on the area involved and the Drake Quarantine Area was duly gazetted. Roads were gated and fences around the area secured. Examinations of all stock within the area were carried out at fourteen day intervals from February to April. No further tick was detected.

Gangs were also organised to examine stock at holdings in clean country adjoining the Drake Quarantine Area, and 10,000 stock were examined. No cattle tick was found.

Control Policies

The 1962-63 control policies were similar to those of 1961-62; i.e., a strategic dipping campaign whereby all stock were treated at twenty-one day intervals for a short period of the year and a reduction in the number of treatments for infested stock. But in 1962-63 the treatments were by organic phosphates in lieu of hydro-carbons.

Control Work East of the Richmond Range.—Within the Richmond, Tweed and Kyogle Quarantine Areas a strategic dipping campaign was carried out between 1st October, 1962, and 15th January, 1963. Stock on every holding were given five treatments at twenty-one day intervals. Some concessions were allowed for calves under three months, due to toxicity problem that arose from organic phosphates.

Staff maintained the dips and supervised the treatments, then some were transferred west of the Richmond Range and the others for the next four months examined stock on holdings to determine the number of and degree of infestations.

Over 95 per cent of stock were treated during the dipping period. The results were considered to be good, although the number of detected infestations was greater than in the previous year.

Area	Number of Infestations Detected			
	1959-60	1960-61	1961-62	1962-63
Bangalow	78	30	14	21
Kyogle	19	11	3	19
Lismore	65	31	8	19
Nimbin	62	26	11	13
Tweed	69	28	4	7
Casino	111	33	20	40
Total	404	159	60	119

The number of inspections made was considerably greater than in 1961-62. Therefore the number of infestations can be accepted as a more reliable indication of the position.

It is of interest that the year was particularly favourable for tick life and, further, this was the first time organic phosphates were used east of the Range. It is also of interest that of the 119 infestations detected, 38 were classed as heavy, 4 medium and 77 light; as compared with 22 heavy, 5 medium and 19 light in 1961-62.

Control Work West of the Richmond Range.—The policy of strategic dipping was undertaken in the Woodenbong, Bonalbo and Tabulam Areas. It comprised four treatments

at twenty-one day intervals, between 1st February and 31st May. The policy also required that all stock be examined prior to movement in these areas.

Although the year favoured tick life, the number of detected infestations was again very limited, as shown:—

Area	Number of Infestations Detected			
	1959-60	1960-61	1961-62	1962-63
Bonalbo	5	1	..	..
Tabulam	9	1	..	2
Woodenbong ..	2	4	2	..
Rivertree	..	2	2	..
Copmanhurst ..	1	..	..	..

Examinations of Stock at Abattoirs.—The policy of retaining an assistant at Macksville Abattoirs and one at Tenterfield Abattoirs to examine stock slaughtered was continued. At Tenterfield he also supervised unloading of cattle moving from Wallangarra by train and dipping of all ex-Queensland calves prior to slaughter. No tick was found at Tenterfield, but large numbers were collected at Macksville. All were identified either as *Haemaphysalis* or *Ixodes* species. No cattle tick was found.

Claims for Compensation

Compensation claims were paid for loss of 101 head of stock, by death or injury, involving £1,823.

Fencing and Dip and Hut Construction

The boundaries were maintained and improved by 17 miles of new fence and 34 miles of extensive repair work.

The Dip Maintenance Gang constructed five new dips within the Tick Quarantine Areas (Tabulam one, Tweed one, Casino two, Bangalow one) and was also used for extensive periods on construction work at the Cattle Tick Research Station, Wollongbar.

Field staff repaired 441 dips within the Tick Quarantine Areas and gravelled 120 dip yards. Over 1,000 dips were emptied, cleaned out and recharged with organic phosphates.

Two huts were constructed, one for the patrol officer on the Queensland Border at Numinbah, and one for the senior assistant at Bottle Creek in the Bonalbo Area. In addition, 17 huts were repaired and 20 tents roofed with iron.

Staff

There was little variation in staff numbers this year; 514 Ministerial staff were employed at the start of the year and there were 507 at the end of June, 1963. Transfers during the year totalled 292. Most arose from administration of the strategic dipping policies.

Investigational Work

Field and laboratory investigations were carried out on problems associated with the use of organic phosphates and other acaricides. Some of these problems are referred to in the following paragraphs.

Development of Methods.—Further work was undertaken at the laboratory in developing analytical techniques for analysis of organic phosphates such as Bayer 21/199 emulsion and ethion. Work was also undertaken to develop a method of analysis for a carbamate (sevin).

Work was undertaken to develop methods for microdetermination of organic phosphates in tissues. So far it has only been possible to analyse specimens in respect of diazinon. Investigations were made also with regard to possible residues in hexachlorophene which is used as a drench for fluke in cattle.

The laboratory facilities were improved by installation of an infra-red spectrophotometer and construction of a gas chromatography unit.

Behaviour of Organic Phosphates in Dips.—Further field work was done on stirring and settling rates, in respect of diazinon, trithion, and Bayer 21/199 emulsion. Manual stirring followed by the use of 10 head of stock was confirmed as required to bring dirty dips up to the normal strength.

This work also showed that 60 minutes after dipping the respective concentration of the dip baths at 3 feet below the surface, for the three materials as follow, was:—diazinon, 80 per cent; Bayer 21/199, 76 per cent; trithion, 78 per cent.

Laboratory investigation of possible depletion of organic phosphates in dips showed that in many cases dips charged with delnav were 25 per cent depleted when left unused for a period of some months. The cause has not yet been determined.

Observations also showed that the stripping rates for both diazinon and Bayer 21/199 emulsion were very considerable. It was found necessary to top-up dips charged with these materials with greater quantities than recommended by the manufacturers.

Hair Analysis.—Observations of hair deposits were made in respect of delnav, diazinon and Bayer 21/199 emulsion.

For *Bayer 21/199 emulsion*: Samples collected from six head of cattle straight after dipping showed an average of 3.42 mgm/gm of hair, with a very even distribution of material over the whole body, but when sampled four days later the amount had fallen to 0.76 mgm/gm. This was a reduction of 78 per cent of the original deposit. It indicated a probable lack of residual protection.

For *Delnav*: A trial was done on three occasions, collecting samples only on the day of dipping. In one trial, using a freshly charged dip, deposits on the underline and mid-rib were considerably higher than those on the back-line. In subsequent trials in dirty dips, this difference was not so marked. This suggested an enhanced wettability of freshly charged dips or some effect due to absence of mud in such dips.

For *Diazinon*: A trial in July, 1962, using six head of cattle, showed a fairly uniform deposit of material but at a fairly low figure. It ranged from 0.98 mgm/gm to 1.877 mgm/gm on individual animals on the day of dipping.

A trial in October, 1962, using 10 head of stock, sampled over a period of 7 days, showed an average deposit of 1.73 mgm/gm of hair on the day after dipping and 0.1 mgm/gm four days after dipping, a reduction of 94 per cent.

A further similar trial, in February, 1963, revealed an even lower initial deposit but a similar degree of loss over a period of four days.

These last two trials indicated the lack of residual protection that could be expected using diazinon.

Microdetermination of Organic Phosphates in Tissues.—Diazinon was the only organic phosphate for which a satisfactory microdetermination method was developed. Some specimens were analysed in trials carried out in conjunction with Geigy Pty. Ltd., and other trials were undertaken by the veterinary officer. Following dipping, amounts up to 4 mgm/kg were found in kidney fat and up to 2.8 mgm/kg in subcutaneous fat. In toxicity trials, where calves were dosed with a known quantity of diazinon, amounts of 30 and 115 mgm diazinon were detected.

Microdetermination of Hydrocarbons in Animals Fats.—Further analyses of fat specimens of cattle killed at Abattoirs within Tick Quarantine Areas were done, as requested by the Department of Primary Industry because of the trade problems associated with residues in meat.

Fat specimens collected during the year revealed varying amounts of DDT up to 42 mgm/kg and amounts of BHC up to 4.2 mgm/kg but, as was to be expected with elimination of hydrocarbons in dips within the Tick Quarantine Areas, the number of samples found to contain DDT and BHC was considerably reduced during the latter part of 1962-63.

The chemist also undertook analyses of fat samples submitted by the Director of Veterinary Research, Glenfield, collected from stock that had been grazed on pastures sprayed with DDT. DDT and BHC were detected in fat samples from both sheep and cattle. With sheep the quantity of DDT ranged from 3.2 to 8.0 mgm/kg, and with cattle from nil to 11.0 mgm/kg in subcutaneous fat and nil to 14.0 mgm/kg in renal fat.

Butter samples collected in the Tick Quarantine Areas were analysed. These revealed amounts of DDT from nil to 20.5 mgm/kg but, again owing to elimination of hydrocarbon dips, the incidence of contaminated samples decreased and no DDT was found in samples collected after February, 1963.

Toxicity of Organic Phosphates.—Following general use of organic phosphates within the Tick Quarantine Areas, reports of mortalities associated with dipping were received. Some investigations were made on the problems of toxicity. Trials were done by the veterinary officer, using facilities provided by the Cattle Tick Research Station, Wollongbar.

In a calf dipping trial using delnav at 0.75 per cent, dipping at three-day intervals, the age of the calves ranged from 2 days to 2 months. Two, aged 2 days and 7 days, developed symptoms. Recovery was complete following treatment with Atropine sulphate.

Three oral dosing trials of calves were done, using diazinon at a strength used in dips, namely 0.05 per cent. One calf, aged 1-2 months, dosed at the rate of 55 mgm/kg diazinon over a period of 1½ hours, showed slight symptoms; one calf aged 6 days, dosed at the rate of 47 mgm/kg over a period of 4 hours, developed symptoms and was eventually destroyed; one calf 2-3 weeks old, dosed at the rate of 39 mgm/kg over a period of 4 hours, showed slight symptoms. A calf 2 weeks old, drenched with 20 per cent diazinon at the rate of 20 mgm/kg, developed symptoms within 2½ hours. This animal was subsequently destroyed. Post mortem findings were typical of organic phosphate poisoning.

This work indicated that an animal would need to drink a large volume of diazinon dip wash to develop symptoms due to ingestion.

QUEENSLAND BORDER CONTROL

Stanthorpe Section

Stock Movements.—Similar conditions to those of the previous year prevailed regarding stock movements in from Queensland. Numbers fell considerably, because of continued drought in western Queensland, heavy stock losses and less breeding. Since the drought conditions have broken, demand for re-stockers within Queensland is keen and on prevailing prices normal New South Wales operators could not buy economically. Most of the stock now crossing are moving to abattoirs.

Stock movements from New South Wales to Queensland increased slightly for cattle and decreased for sheep. The cattle increase was due to re-stocker activity and herd bull movements. For sheep, the main movement has been of fat lambs for New England and the north-western slopes to Brisbane markets.

Figures covering interstate movements are as set out hereunder:—

To New South Wales				
Gate	Cattle	Sheep	Swine	Horses
Wallangarra	94,971	7,786	21,517	3,824
Stanthorpe	6,110	3,379	..	327
Riverton	1,032	8,310	..	5
Killarney	..	..	740	206
The Summit	..	8,312	..	10
Totals:	102,113	27,787	22,257	4,372

To Queensland				
Gate	Cattle	Sheep	Swine	Horses
Wallangarra	2,266	193,834	..	294
Stanthorpe	1,075	2,510	..	157
Riverton	..	3,624	..	..
Killarney	3,619	2,067	..	137
The Summit	..	1,400	..	..
Totals:	6,960	203,435	..	588

Dip Revenue Collections Within Section.—In fees for dipping of stock, £4,367 was the total revenue; £3,969 at Wallangarra and £398 at Stanthorpe. Considerable Queensland cattle, according to Schedule of origin, move to meat works in New South Wales without treatment. This accounts for discrepancy between total numbers that crossed and the dipping revenue.

Fencing.—A further two miles of four-barbed wire border fencing was erected in the Limestone Creek section at £1,100 per mile. The contract requires also the removal of existing netting and marsupial wire from the old fence and re-fitting of it to the new fence. On the Donnybrook section of the border, some eighty-two chains of new five-barbed wire fencing have been erected.

Also, two and one half miles of renovations on the Acacia Plateau, Killarney section, one and one half miles of similar work in the Acacia Creek-Barlow's Lane section and two and one half miles in the Cullendore section were done as normal staff work. A half mile of four-barbed wire fencing erected by staff on the boundary of the Quarantine Reserve, Stanthorpe Crossing Place, completed this project; and three-quarters of a mile of similar fencing was erected by staff on Sugarloaf Quarantine Reserve.

Goondiwindi Section

Stock Movements.—The stock crossing from Queensland to New South Wales and vice versa were in comparable numbers to those of 1961-62. The greatest difference was in store sheep movement, and there were increased numbers of fat stock both ways.

A continuing noticeable feature is the increased number moved by motor transport. Frequently as many as ten to twelve trucks are used in lifts of cattle and sheep by an owner.

There has been no report of P.P.C. incidence in cattle introduced from Queensland during the year. Some concern has been caused by movement of loose horses from Schedule "T", destined for New South Wales knackeries. Full inquiries have been made at all times before allowing entry.

The following table of stock movements to and from New South Wales compare the years 1961-62 and 1962-63:—

N.S.W. to Qld.	Cattle		Sheep		Swine		Horses
	Fat	Store	Fat	Store	Fat	Store	
1963	14,959	65,173	20,023	159,142	14	99	5,036
1962	9,450	74,743	19,381	157,242	1	29	4,336
Qld. to N.S.W.							
	Fat	Store	Fat	Store	Fat	Store	
1963	12,751	19,820	98,404	242,202	..	..	126
1962	11,060	20,214	95,112	211,458	..	12	147

Dips and Dipping.—Yards and Dips were kept in good repair. There were variations in the results of analyses of samples taken from the three Dips charged with bercotox, particularly after hand stirring, although the Dips concerned were always hand stirred in the same manner. There was even an unexplained difference between two consecutive samples taken from the one Dip, after hand stirring, where no stock had been dipped during the period between samples.

Revenue from the three Dips (Goondiwindi, Keetah, Texas), each bercotox charged, totalled £372; as against £679 in 1961-62.

Border Fences.—The fences forming the border in the Goondiwindi Section, are owned by the landholders adjoining the border rivers. There are a few exceptions, where Reserves run in on to the rivers for watering purposes. Frequent sharp rises in the border rivers damaged fences on low lying stretches, but these were repaired or renewed as quickly as possible after flooding. This, and extensive cultivation of the land on the immediate river frontages east of Keetah, where stock are depastured mainly well back from the river flats, have eased the positions. Few complaints of stock straying into this State from Queensland have been received.

West of Mungindi Section

Stock Movements.—The very wet year slowed up travel of stock, on the hoof and by transport. Heavy flood run-off from Queensland Rivers was a problem for all movement for about three months on parts of the Border. Thus, the numbers of stock crossing at various points declined by comparison with 1961-62.

There was also a big reduction in number of lice infested sheep presented at the Border, compared with 1961-62.

New Crossing Place.—One new crossing place was gazetted in this Section during the year (Glendalough).

Aboriginal Station at Brewarrina.—This was visited for inspections. The only stock there, owned by the Station, were two aged horses.

Inspection for T.B. Reactors.—Five trips were made to inspect T.B. Reactors, from Merintu, Queensland. One trip was made to "Budgerigar" to inspect and value T.B. Reactors for Compensation.

Stock crossing for the past twelve months were as follows:—From *Queensland to New South Wales*, 41,793 cattle and 235,373 stock other than cattle; and from *New South Wales to Queensland*, 1,617 cattle and 181,676 stock other than cattle.

DIVISION OF SCIENCE SERVICES

Biology Branch

GENERAL

Interstate Experience of Plant Indexing for Virus Diseases.—On separate occasions three members of the plant pathology staff visited the Biology Branch of the Victorian Department of Agriculture to observe the techniques and facilities of that organisation. These visits had special relation to the indexing of plants for the presence of virus diseases on imported selected varieties that are used for this purpose. The reaction caused by specific viruses was demonstrated and discussed by Mr. L. L. Stubbs. The observations help the recognition and establishment of virus-free propagating material in New South Wales.

Overseas Visits.—Dr. C. D. Blake returned to duty after having spent two years studying nematology at the Rothamsted Agricultural Experiment Station, England.

Mr. P. F. Kable is at present carrying out post-graduate work at the University of Cornell, United States of America.

Dr. Lilian Fraser was invited to attend the Third Congress of Citrus Pathologists to be held in Brazil. In an effort to assure her attendance the Government of Brazil offered to meet part of the expenses which would be incurred.

Sterilization of Soil.—The Biology Branch has co-operated with progressive nurserymen in the local adaptation of the air/steam technique of soil sterilization developed by Professor Baker of the University of California.

Visitors from Overseas.—Professor O. N. Allen, who occupies the Chair of Soil Microbiology at the University of Wisconsin, visited to discuss field problems and laboratory control of legume inoculants. He is an authority in both these aspects and is interested in the methods of quality control collaboratively developed here by the University of Sydney and New South Wales Department of Agriculture. An exchange of cultures for field legumes was accepted, towards improving the efficiency of commercial cultures available here.

Dr. Mary Glynne of the Rothamsted Agricultural Experiment Station spent several days at the Biology Branch. In a seminar and in discussions with the staff she described her concepts of the nature of foot rot and related diseases of wheat, methods of evaluation of their incidence and importance, and the influence of rotation and fertilizer practices on their occurrence. There would appear to be scope for further testing of rotation and different fertilizer levels on the incidence of foot rot and take-all on crop yield in Australia.

PLANT PATHOLOGY SECTION

New Plant Disease Records

Sixty-seven new plant diseases were recorded in this State.

Lettuce necrotic yellows virus (Stubbs and Grogan, 1963) was identified on prickly lettuce, milk thistle and lettuce.

Grey leaf spot of tomato, caused by *Stemphylium solani* Weber, was recorded from the north coast. This disease has been present in southern Queensland for some time and, although earlier presence in N.S.W. has been suspected, this is the first definite record.

Surveys of powdery mildew on cucurbits resulted in several new host records on species of *Cucumis* and *Citrullus*. In all cases the fungus was present only in the conidial stage and resembled conidial *Sphaerotheca fuliginea* (Schlecht.) Poll.

On pasture plants a rust, *Uromyces anthyllidis* (Grev.) Schroet., previously not known in Australia, was found on various species of *Medicago*, but not on lucerne. A *Cercospora* resembling *C. canescens* Ell. & Mart., caused leaf damage to crops of *Glycine javanica* and *Lotononis bainesii*, two legumes with promise for the north coast.

In the fruit crops, symptoms resembling those caused by apple russet ring virus (Reeves & Cheney, 1959) were seen on fruit from Batlow. A leaf spot of suspected virus origin was recorded on Josephine pears at Bilpin. A leaf spot of strawberry, caused by *Cercospora vexans* Mass. in Sacc., was seen at Epping.

Iris rust *Puccinia iridis* Rab. was the most notable new disease of ornamental plants recorded. A *Rhizoctonia* sp. caused severe leaf damage to rooted cuttings of several plant species in a nursery glasshouse.

Other interesting records were the isolation of *Podosporiella verticillata* O'Gara, from leaf spots of wheat and ryegrass; *Pythium aphanidermatum* (Edson) Fitzpatrick, stem rot of cotton; and leaf blight of antirrhinums caused by a species of *Pseudomonas* possibly *P. antirrhini* Takimoto.

Identifications of Fungi

Sheep Facial-Eczema Fungus in Pastures.—Several pasture samples were sent in through the Veterinary Research Station, Glenfield, for examination for presence of spores of *Pithomyces chartarum* (Berk. & Curt.) M.B. Ellis, the fungus responsible for facial eczema of sheep. In several samples, mainly from the south, along the Murray River, spores of *P. chartarum* spores were found but only in very small numbers. In no case have spores been seen in numbers approaching those in New Zealand pastures where facial eczema occurs. The fungus appears to be common in N.S.W. but conditions normally are not favourable for a build-up of large numbers of the spores in pastures.

Mushrooms.—Many mushrooms were submitted for identification. There are several closely related species of *Agaricus* in N.S.W. that are often collected for eating. Amongst these are members of the (*arvensis*) horse mushroom group and the yellow-staining (*xanthodermus*) mushroom group. Members of both have been suspected from time to time of causing gastric trouble. Because of our lack of knowledge of the edible and poisonous qualities of most Australian fungi, the general recommendation made by the Biology Branch is that only cultivated mushrooms or the common field mushroom (*Agaricus campestris* L. ex Fr.) be eaten.

The Biology Branch Herbarium

A large number of N.S.W. specimens and exsiccati from overseas were added to the Herbarium. The most notable addition was portion of the issue of the Mycoflora saximontanensis exsiccata, kindly sent by Dr. W. S. Solheim of the University of Wyoming. Only slight progress was made in comprehensive indexing of the Herbarium.

The Check List of Plant Diseases in N.S.W.

Examination of over 5,000 specimens of plant diseases from N.S.W. was completed this year and a start was made on writing a revised check list and examining the N.S.W. literature on plant diseases. Many identification problems have arisen during this work, and the first in a series of papers dealing with these was published this year.

Cereal Diseases

Wheat Diseases.—Wheat production reached an all time high this season. There were record yields, and generally disease did not cause major loss.

Frost fairly seriously damaged some early crops, particularly in the north west. Most of the damage could be traced back to August. Some crops showed signs of leaf, tiller and head frosting.

Take-all (*Ophiobolus graminis*) was again fairly widespread, particularly in the Inverell district. Most damage was where wheat had been continually sown for about four years and also where wheat immediately followed native pasture.

Foot-rot (*Fusarium graminearum*) was not at all common in the north-west this year. Similar symptoms seen in some crops were caused by *Helminthosporium sativum*.

Loose smut (*Ustilago nuda*) was prevalent in some crops. Infections as high as 20 per cent occurred in the variety Heron.

Flag smut (*Urocystis agropyri*) has been only minor in wheat for several years, because of widespread use of resistant varieties. With introduction of the susceptible Gamanya and Mengavi varieties it will again become important. There were several reports of it this season.

An unusual leafspot was present on wheat specimens from Albury. *Podosporiella verticillata* was repeatedly isolated from these leafspots and from similar leafspots on ryegrass growing alongside the wheat. This fungus has previously been recorded as a rare seed-borne disease of wheat but seems not to have been previously recorded causing a leafspot of wheat.

Reports from the Wheat Board indicated that a high percentage of black pointed grain was received from the Werris Creek-Gunnedah region.

Loss through hail for the season was estimated at 0.75 per cent of a total crop of 110,000,000 bushels. The volume of the total crop caused some delay in deliveries. This lengthened the harvest period and in consequence increased hail loss slightly.

Oat Diseases.—The oats acreage was slightly above average. Diseases were only minor. Barley yellow dwarf virus and halo blight caused by the bacterium *Pseudomonas coronafaciens* occurred in a few crops.

Maize Diseases.—Maize diseases were less serious than in the previous season. Leaf blight (*Helminthosporium turcicum*) was notable on some crops in the Parramatta region in February.

Root and stalk rot (*Diplodia zae*, *Fusarium* spp., and *Macrophomina phaseoli*) damaged some crops. A 50 per cent loss in a crop at Tamworth was caused by *Macrophomina phaseoli*.

Some sweet corn crops, in various areas, showed chlorotic striping and scorching of the leaves, but only in Iochief and the female parent of this hybrid. The condition may be due to a genetical abnormality transmitted through the female parent.

Special Quarantine Precautions on Imported Maize Seed.—Numerous maize seed lines imported this year from the U.S.A. carried boil smut spores. The seed was chemically treated and, as a special precaution, only 20 seeds of each line were released for planting, under quarantine. Subsequent inspections of plants from this seed revealed no boil smut infections.

Sorghum Diseases.—There was a high percentage of seedling blight in many sorghum crops, particularly in the north west. *Fusarium moniliforme* was responsible for most of it. This fungus usually only causes damage when conditions do not favour the seedling just prior to or just after emergence.

Serious loss by lodging of hybrid sorghum crops occurred in Gunnedah district towards the end of the growing season. Some of the crops were not worth harvesting. Two separate factors were concerned. Early crops were heavily infected with the fungus *Macrophomina phaseoli* which caused lodging. Later crops met environmental conditions which caused premature breakdown of stalk tissue.

Rice Diseases.—No parasitic rice disease was recorded this year.

Diseases of Field Crops and Pasture Plants

Cotton Diseases.—Cotton is still relatively disease-free in this State. Some major cotton diseases in overseas countries have not been recorded here.

Angular leaf spot caused by the bacterium *Xanthomonas malvacearum* was widespread. Boll rot (*Rhizopus* sp.) and a root rot (*Pythium aphanidermatum*) damaged some crops.

Linseed Diseases.—Pasma disease (*Septoria linicola*) was the most serious. It was widespread. A loss of 30 per cent occurred in one crop at Parkes. Rust (*Melampsora lini*) and frost injury occurred in some crops.

Sunflower Diseases.—The fungus *Macrophomina phaseoli* caused a serious root and stalk rot of a sunflower crop at Moree, reducing the yield by 50 per cent. This fungus has a wide host range and has seriously damaged several hosts this season.

Soybean Diseases.—A leaf disease called bacterial pustule (*Xanthomonas phaseoli* var. *sojense*), and charcoal rot (*Macrophomina phaseoli*) were the most serious.

Grass Diseases.—The rusts, smuts and powdery mildews of grasses were as widespread as usual. These rarely kill the plants.

Ryegrass blind seed disease (*Gloeotinia temulenta*) was recorded again. This disease was first recorded in N.S.W. last season. It might not become very important, because of our environmental conditions, but will be closely watched for rate of spread.

Ryegrass specimens from Albury had a leafspot from which *Podospora verticillata* was isolated. The ryegrass was growing alongside wheat similarly affected.

Cowpea Diseases.—Stem rot (*Phytophthora vignae*) was very severe. It even attacked the highly resistant Blackeye 5 variety, indicating that conditions really favoured it.

The conditions also favoured powdery mildew (*Oidium* sp.). In a field trial, the varieties Poona and Caloona were heavily infected; Cristaudo and Blackeye 5 were mildly affected, and Havana and Malabar were completely resistant.

Diseases of *Glycine javanica*.—A new leaf spot on this host was recorded on the north coast. It was first recorded in a quarantine crop growing at Grafton Experiment Farm. *Cercospora* sp. closely resembling *C. canescens* was fruiting freely on the leaf lesions.

Clover Diseases.—The leaf diseases were as widespread as usual. These rarely cause economic loss. Leaf fall is only serious when infections are severe.

Some virus symptoms were observed on various clover species. Subterranean clover stunt appeared most commonly and caused most damage.

Parasitic plant nematodes and especially root knot nematode (*Meloidogyne* spp.) were common on clovers, especially on the central and north coasts.

Lucerne Diseases.—Lucerne, particularly inland, is commonly infected by Witches' broom virus but usually symptoms are not obvious in stands until these are at least 18 months old. Inland stands only 12 months old were examined this year and there were obvious symptoms of this disease. Four-year old stands had 70-80 per cent infection.

Root rots (*Helicobasidium purpureum*, *Macrophomina phaseoli*, *Phytophthora* sp., *Sclerotium rolfsii* and *Fusarium* sp.) were in individual stands.

Diseases of Vegetable Crops

Potato Seed Certification.—Records compiled by Division of Plant Industry showed that 1004 acres of the variety Bungama (34 crops) were rejected from certification on the central and southern tablelands because of excess virus leaf roll content. Infections in individual crops varied from four to 60 per cent.

The original infection in Bungama was traceable to seed produced by one central tableland grower in 1960-61, and variations in leaf roll incidence were attributable to varied levels of aphid vectors in crops of Bungama on the southern and central tablelands in 1961-62, after a second certification inspection.

Aphid vectors were in the crops of Bungama and other varieties on the central and southern tablelands this season but where aphicidal control was vigorous and roguing had been thorough the crops were brought to certification standard. A total of 43½ acres of Bungama was passed for certification.

Other rejections for excessive leaf roll content were Sebago 7½ acres (3 crops), Sequoia 1 acre (1 crop), and Kennebec ½ acre (1 crop). A 12-acre crop of Sequoia was rejected on the southern tablelands for excessive content of blackleg (*Erwinia atroseptica*).

Potato Late Blight (*Phytophthora infestans*).—Wet weather led to this disease in coastal crops in late spring, and up to 30 per cent of the Windsor and Richmond crops were partially defoliated by it. Heavy infections also occurred in northern tablelands crops in early summer and in central tableland crops in late summer.

In co-operation with Division of Plant Industry the project for development of potato varieties immune to late blight has been continued. This year showed that 19 agronomically promising seedlings were immune to race "O" of *P. infestans*. Eighteen of these seedlings were derived from the American, blight-immune parents Pungo (1), Kennebec (2), Saco (2), Placid (1) and B595-76 (12) and one from the Scottish seedling 1928 (e) 2.

Potato Common Scab (*Streptomyces scabies*).—In co-operation with Division of Plant Industry, development of scab resistant varieties has been continued. In this year's crossing programme at Glen Innes Agricultural Research Station the scab resistant varieties Blanca, Cherokee, Haig, Navajo, Ontario, Osage and Redskin, B595-76 and X927-3 were parents in a wide range of crosses with varieties and seedlings of good agronomic type.

A scab resistance trial was conducted at Spring Hill on the central tablelands. It included overseas varieties for which scab resistance has been claimed, and advanced Departmental seedlings. Ratings for scab reactions were made on a 0-4 basis, dependent on severity of scab lesions, and a scab index number (maximum 4) was then calculated for each variety of seedling. The results were as follows: Huron, a scab resistant variety ex Canada, scab index No. 0.10; Haig, a scab resistant variety ex U.S.A.; 0.29; S2866 (Menominee x Redskin, both scab resistant varieties ex U.S.A.) 0.35; S2888 (11-79 x Redskin) 0.36; S2881 (Awaba x scab resistant U.S.D.A. seedling 336-123) 0.98; S2885 (Awaba x 366-123) 0.98; S2884 (Murru, a scab resistant variety x Adina) 1.00; Tawa (a reputedly scab resistant variety ex U.S.A.) 1.30; Exton, a susceptible control, 1.30; and Onaway, a reputedly scab resistant variety ex U.S.A., 1.50. High resistance to scab is being transmitted to progeny by the varieties Redskin and Menominee.

"Witches Broom" Disease of Potato.—Research has now shown that the abnormality is not caused by an infectious agent. It is considered to be a tuber-transmitted abnormality, like the Scottish "wildings", and possibly caused by a somatic mutation. It was not observed in commercial crops this year but a few plants of the Sequoia variety were affected in a trial at Orange.

Rugose Mosaic of Potato (*Potato Virus X* + *Potato Virus Y*).—The advanced seedlings S2869, S2879, S2882 and S2883 were tested for their field reaction to aphid infection by *Potato Virus Y* (PVY). Infection was not achieved. This work is continuing.

Yellow Top of Tomato (*Tomato Yellow Top Virus*).—There was marked decline in economic importance of this disease in coastal tomato crops this year. Use of systematic organic phosphate insecticides to eradicate the aphid vectors has become routine practice.

Continuing work reported last year, an experiment at Rydalmere tested the effect on overall yield and fruit set, of infection at time of flowering of the first and second hands and at time of flowering of the fifth and sixth hands. Infection at the time of flowering of the first and second hands reduced overall yield by almost 45 per cent and almost 30 per cent in fruit set. Infection at time of flowering of the fifth and sixth hand had no effect. There was no difference in the effects of yellow top virus from the north coast and a strain from Sydney metropolitan area.

Tomato Wilts (*Fusarium oxysporum* f. *lycopersici* and *Verticillium dahliae*).—Cultures of these fungi were supplied to Division of Plant Industry to use in its programme for breeding varieties resistant to these pathogens.

Tomato Leaf Mould (*Cladosporium fulvum*).—This developed extensively and severely in north coast tomato crops in the very wet autumn, on varieties usual in that area. However, plantings of S.T.E.P. selections showed resistance to the strain or strains of the pathogen in that area.

Tomato Grey Leaf Spot (*Stemphylium solani*).—This leaf spot has been present in Queensland for some years. In the autumn of 1963 it was recorded for the first time in New South Wales, widespread in far north coast crops. The disease can severely defoliate tomatoes but has been well controlled by Maneb sprays applied at 7-10 day intervals.

Asparagus Decline and Replant Problem, Gundagai.—Plant pathological aspects of declining yields and failure of replanted areas in a large commercial asparagus planting at Gundagai have been studied. *Fusarium oxysporum*, *F. moniliforme* and *F. moniliforme* var. *subglutians*, have been shown to cause rotting of feeder and storage roots of the plants and crown rot and flecking of edible spears. The three pathogens are widely distributed over the area where asparagus has been grown or where it is now growing, and in seedling blocks planted in recent years.

Where little new land is available for new plantings, solution of the problem will be by selection of resistant or tolerant strains of the variety Mary Washington. Seed of a tolerant selection of this variety has been obtained from the University of California and planted at Gundagai. Early growth of the plants is very promising.



"Misted" Concentrate

Misting machines have been shown to distribute concentrated protectants uniformly and efficiently for control of tomato diseases.

Seed is also being harvested from surviving plants in an area replanted four years ago, where 60 per cent mortality has occurred. This seed will be sown in infested soil in a glasshouse at Gundagai, for selection of tolerant or resistant lines.

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Disease Control by Use of Misting Machines.—The value of the misting machine for fungicide application to tomato crops was well illustrated in north-coast crops during the very wet 1963 autumn. Good control of Early Blight (*Alternaria solani*) was obtained where a 7-10 day interval misting schedule was maintained. There were heavy foliage infection and fruit loss where because of the wet ground it was not possible to apply a fungicide schedule with high volume spraying equipment.

Statistical analyses of the results of the 1961-62 experiment at the Horticultural Research Station, Narara, were foreshadowed in last year's report. These showed no differences in control of early blight fruit rot of trellised tomatoes when plants were given one of the following six treatments at weekly intervals:—

- (a) High volume application of copper oxychloride 8 oz. to 20 gallons water throughout the life of the plants.
- (b) High volume application of copper oxychloride 8 oz. per 20 gallons water till start of fruit ripening then strength increased to 12 oz. per 20 gallons.
- (c) Application by misting machine of copper oxychloride 4 oz. per 2 gallons water throughout the life of the plants.
- (d) Application by misting machine of copper oxychloride at 4 oz. per 2 gallons water till start of fruit ripening then strength increased to 6 oz. per 2 gallons.
- (e) Application by misting machine of copper oxychloride at 2 oz. per 2 gallons of water throughout the life of the plant.
- (f) Application by misting machine of copper oxychloride at 2 oz. per 2 gallons water till start of fruit ripening then strength increased to 3 oz. per 2 gallons.

Relative rates of copper deposition on the leaves and stems of plants receiving the six treatments were determined by Chemistry Branch. There was significantly higher weekly copper deposit on the leaves receiving treatments (c) and (d) than was so with the four other treatments. The latter did not differ significantly from each other in this respect. The cumulative deposit of copper on the leaves at the end of the trial was also significantly greater in treatments (c) and (d) than in the other treatments. Treatment (b) gave a significantly higher cumulative copper deposit on the leaves than did (a), (e) and (f). The three latter did not differ significantly from each other. Cumulative deposition of copper on the stems was also significantly higher in the treatments (c) and (d) than in the other four treatments and was significantly higher in treatments (a) and (b) than in treatments (e) and (f).

Under the conditions of the experiment the relative copper deposits bore no relationship to early blight fruit rot control and the 4 oz. per 2 gallons misting treatment throughout the life of the crop is the present standard recommendation.

The Narara project continued in the 1962-63 season. The 4 oz. per 2 gallons and the 2 oz. per 2 gallons weekly misting rates and a 4 oz. per 2 gallons fortnightly misting rate were compared. Under very wet autumn conditions, the weekly application of copper oxychloride at 4 oz. per 2 gallons gave the highest yield of clean fruit. Greater fruit loss was experienced with the other two misting schedules; and there was over 60 per cent loss of fruit through early blight rot, *Phoma* rot and anthracnose in untreated plants.

Chemistry Branch is again assessing the relative copper deposits from the various treatments.

Bean Seed Certification Scheme.—In co-operation with Division of Plant Industry the Bean Seed Certification Scheme continued for the 20th successive season.

Of 27 crops submitted, 15 were certified and four were approved. Of the eight crops not certified or approved, four were rejected because of anthracnose, two because of halo blight, one was picked for green beans and one crop failed.

Quantity of seed produced on the south coast has further declined. Unfavourable seasonal conditions and disease outbreaks were reported last year as causing low production. Competition from Queensland, producing at a lower cost, has also been important.

Root Rotting of Stringless French Beans.—This disease again caused considerable losses in many crops grown for processing in western and south-western districts. *Macrophomina phaseoli* and other fungi including *Rhizoctonia* sp. and *Pythium* sp. have been associated.

Stringless bean breeding lines produced by Division of Plant Industry at Yanco Agricultural Research Station were inspected and healthy. Numerous, adjacent rows of introduced varieties were affected by the disease. The significance of this observation has not been established.

Inoculation experiments are being carried out to further investigate this problem.

On two occasions *Macrophomina phaseoli* was found to be the cause of black rotting of bean seedlings submitted from the Seed Testing Laboratory. *Rhizoctonia* sp. was found to be the cause of brown lesions on the hypocotyl of a bean seedling in another germination test.

Cucurbits Powdery Mildew (*Oidium* sp.).—For years this disease has limited rockmelon production in the M.I.A. and Lower Murray districts. This season for the second year it appeared early, in mid-December, but early crops were less severely affected than in the previous season.

Rockmelon breeding lines produced by Division of Plant Industry at Yanco Agricultural Research Station were inspected. The techniques and inoculum for screening these lines for resistance to powdery mildew and Fusarium wilt (*Fusarium oxysporum* f. *melonis*) in the seedling stage under glasshouse conditions had been supplied by this Branch.

Seedsmen's selections of two varieties recently released in the U.S.A. were marketed as Gold Coast and Tardello, but have not become popular inland. They do not have suitable horticultural characteristics and are not resistant to the inland powdery mildew race.

Studies on the identity of the cucurbit powdery mildew and rockmelon variety reactions were continued. Only the imperfect stage of this fungus has been collected in New South Wales, and it resembles that of *Sphaerotheca fuliginea*. Over 80 collections from a variety of cucurbit hosts and from many areas of the State have been examined. All resemble *S. fuliginea* in having long chains of conidia, well developed fibrosin bodies and forked germ tubes.

In the U.S.A., numerous rockmelon varieties have been bred for resistance to powdery mildew, and many of the cucumber varieties bred for resistance to other diseases also have varying degrees of resistance to powdery mildew. The reported reactions of these varieties in the U.S.A. have been confirmed at Rydalmere this season. This is important for plant breeding and fungicidal control, if *S. fuliginea* is the only cucurbit powdery mildew fungus in New South Wales. *Erysiphe cichoracearum* is the only such fungus in the U.S.A., as indicated in the literature.

A preliminary note on the work has been published.

Plants of the varieties PMR 45, PMR 6 and Rio Gold were among those uniformly resistant to powdery mildew when grown at Rydalmere from seed obtained from the breeding institutions. However, commercial lines of these varieties varied considerably in their reaction to this disease. Some lines were resistant, some lines were susceptible and others were a mixture of resistant and susceptible plants.

When PMR 45 and PMR 6 were grown at Griffith, from seed obtained from the breeding institutions, PMR 45 was severely affected by powdery mildew and PMR 6 was resistant. It is of interest that also during the 1959 autumn PMR 6 was resistant, but was severely attacked the following season. On several occasions at Yanco Agricultural Research Station a rockmelon variety has been resistant to powdery mildew for one or more seasons but susceptible to the disease later.

The overwintering method of cucurbit powdery mildew has received attention. A wide variety of sheltered locations in Griffith district were searched at the end of winter for volunteer cucurbit plants on which the conidial stage of the fungus could survive. No such living plants were found. French bean has been shown to be an alternative host for the cucurbit powdery mildew under artificial conditions.

The fungicidal control work done in the 1961-62 season has been published.

In a Griffith trial several fungicides were applied weekly by misting. The effective control given by karathane ($\frac{1}{2}$ oz. 25 per cent W.P./gall.) and Bayer 4964 ($\frac{1}{2}$ oz. 25 per cent W.P./gall.) confirmed the previous season's results. A liquid formulation of karathane ($\frac{1}{2}$ fl. oz. 33 per cent L.C./gall.) gave equally good control, and the experimental fungicide WL4204 ($\frac{1}{2}$ oz. 50 per cent W.P./gall. and $\frac{1}{2}$ oz. 50 per cent W.P./gall.) appeared promising. None of these fungicides caused significant plant injury.

Downy Mildew of Cucurbits.—This disease severely injured cucumber crops in the abnormally wet autumn in the near-metropolitan area. It also affected vegetable marrow (*Cucurbita pepo*) for the first time since 1941.

Pea Stunting and Rosetting.—This disease appeared for the third successive season in the central tablelands. It is still under investigation at the Division of Entomology, C.S.I.R.O., Canberra.

It appeared frequently throughout the Orange district until mid-December. Young crops showed abundant infection and some older crops were a total commercial loss. Sowings completed since early December remained apparently free of this trouble.

Lettuce Necrotic Yellows (Virus).—The first record of this in N.S.W. was at Albury in the winter of 1962. It is now known to be widespread in the State. It was most prevalent in the spring in the near metropolitan area and the Hunter Valley. In most outbreaks only a low percentage of plants were affected.

The lettuce necrotic yellows virus has been identified in milk thistle (*Sonchus oleraceus*), which is the only known source of the virus. Eradicating milk thistles in the close vicinity of lettuce crops has been found to control the disease in southern States and is now advised in New South Wales.

Vegetable Improvement Committee.—A Vegetable Improvement Committee has been formed for co-operation between Division of Plant Industry and the Biology Branch in formulating breeding programmes for production of disease resistant vegetable varieties.

Mushroom Culture and Mushroom Diseases

The trend towards indoor mushroom culture in properly constructed mushroom houses with proper insulation and installation of heating and sterilizing facilities is continuing. It reflects increasing demand for processed mushrooms and mushroom soup. Food processing companies now absorb 75 per cent of local production, now estimated at £1 million annual value. The quality of mushroom spawn supplied by commercial mushroom spawn producers continues to be very satisfactory.

Diseases.—Yield reductions in inefficiently composted mushroom beds occurred as a result of mat disease (*Myceliophthora lutea*) and eelworms (*Rhabditis* types). There were some complete crop failures. Both *M. lutea* and *Rhabditis* are in the manure or manure straw mixtures supplied to the growers but where the compost is properly sterilized prior to spawning the beds these organisms are not important.

The blotch disease (*Trichoderma viride*) of mushroom caps and stalks was recorded for the first time in this State. This was during the prolonged wet and humid autumn and on several crops.

Citrus Diseases

Losses due to black spot were light in coastal orchards. Seasonal conditions have not favoured a severe outbreak of this disease since 1958.

No commercial loss due to *Septoria* spot occurred this season in the M.I.A.

Rhizoctonia development in seedbeds was abnormally severe in the spring in coastal nurseries and some heavy losses were experienced.

Phytophthora Diseases.—Continuous wet weather in autumn and winter encouraged brown rot (*Phytophthora citrophthora*) fruit infection in coastal orchards. Losses were heavy in some areas. The disease was also seen in the M.I.A. It is rare there.

Tests for resistance to *Phytophthora* root rot are being carried out this year on four sour orange selections, introduced varieties *Citrus macrophylla* and *Citrus taiwanica* from California and Cleopatra mandarin from Florida, and four trifoliata x blood orange hybrids. These are being compared with standard rough lemon and *Poncirus trifoliata* and with local selections of Cleopatra mandarin.

Also two F₁ seedlings of Cleopatra mandarin x *P. trifoliata* and 56 F₁ seedlings of Scarlet mandarin x *P. trifoliata* are being tested.

Continuous rain, and coastal river floodings, during autumn and winter caused further deterioration of trees on rough lemon stock particularly in Hawkesbury River areas.

Virus Diseases.—The work was collaborative with officers of the Division of Horticulture.

Grapefruit Stem Pitting.—Observations continued on several blocks of grapefruit on growers' properties and on Departmental research stations at Somersby, Dareton and Yanco where trees carrying mild strains of stem pitting are under trial for protection against field infection with severe strains. No breakdown has occurred in these blocks. However, the parent tree of one of the mild strain budlines is now bearing fruit classed as fairly severely affected, and a parent tree selected 15 years ago as a severe type has carried normal fruit for the last three years though its progeny continue to bear badly affected fruit.

A block of originally virus-free trees at Narromine is also being used to test the efficacy of mild strain protection. A severe strain of stem pitting had been spreading in this block for the past three years. Obviously affected trees were removed and those showing no apparent symptoms of the disease were budded with mild strain selections. At the same time buds were taken for indexing on West Indian Lime, to establish the virus status of the trees at the time of inoculation.

In 1958 selected mild-strain infected grapefruit were propagated onto two-year old rough lemon stocks at Narara Horticultural Research Station. Growth from the buds in the following spring was poor, distorted and yellow. Artificially, a high proportion of the stocks had become infected with the severe seedling yellows virus prior to budding. This was influencing the growth of the buds. These trees were retained for observation and have apparently recovered from the seedling yellows virus infection. Dr. J. M. Wallace in California has recently shown that recovery of this kind can leave the tree with a factor which protects against re-infection with seedling yellows. Propagations of recovered trees have therefore been made for field and glasshouse testing.

Scalybutt (*Exocortis*) and Stunting of Trees on *Poncirus trifoliata*.—A tree of the Department's selected Lambert nucellar Eureka lemon, hitherto thought to be scalybutt-free, developed scaling symptoms this year at Narara Horticultural Research Station. Whether nematodes could be involved in this transmission is now being tested.

An assessment of the behaviour of the Allen Valencia, a selection of scalybutt-free Valencia, which has been used in several trials of *P. trifoliata* stock selections showed that trees of this bud line are stunted in comparison with other bud lines and with nucellar. They may therefore be carrying a stunting factor. However, a low percentage of trees of Allen Valencia on *P. trifoliata* are normal size. It suggests that if the stunting factor is a virus, as seems likely, a few buds can escape infection. This was noted also in a scalybutt transmission experiment. Two trees in the total of 60 are still not scaling, 17 years from budding.

Lemon Crinkle.—As a result of tests several years ago it was concluded that the lemon crinkle virus was not related to psorosis virus as previously believed. Dr. Wallace of the Riverside Citrus Research Station, California, has provided seed of *Citrus moi* so that further testing can be done. *Citrus moi* is stated to be a much more sensitive indicator for psorosis than those previously used. Indexing has started, using seedlings of this variety.

Xyloporosis.—There has been difficulty in indexing citrus onto sweet lime to distinguish between the reaction caused by tristeza and the reaction recorded overseas by xyloporosis. To resolve this difficulty, budwood said to carry only xyloporosis was imported some years ago from Florida. This has been used to compare its reaction, on a series of citrus seedlings, with reactions caused by local selections of stem pitting and seedling yellows with and without a local disease of Ellendale mandarins considered to be xyloporosis. The progress results indicate that:—

- (i) The Florida xyloporosis does not cause any reaction on sweet lime within two years.

- (ii) The Australian stem pitting and seedling yellows (Tristeza) complex causes pitting and various degrees of gumming of xylem in the bark of sweet lime, depending on the severity of the virus strain used.

- (iii) When the Florida xyloporosis and Tristeza virus complex are introduced into the test plant at the same time, the severity of the reaction shown by sweet lime is less than that when only the tristeza complex is used.

- (iv) Ellendale mandarin seedlings react to the Florida xyloporosis by producing yellow blotches on leaves and premature defoliation. This reaction has not occurred when Ellendale seedlings have been inoculated with the Australian xyloporosis plus the tristeza complex or with the tristeza complex alone.

Therefore, either the Australian disease is not xyloporosis, though it describes exactly, or another virus is present in the Florida budwood. Further tests are in progress.

Yellow Vein.—Citrus yellow vein virus was introduced from California for testing in conjunction with local selections of woody gall virus. In California a combination of the two viruses greatly increases the yellow vein symptoms. A similar reaction occurred when Australian material was used, although in this case tristeza-stem pitting strains were also present. They appeared not to have any effect on the synergism of yellow vein and woody gall. The synergistic reaction greatly simplifies the detection of woody gall in symptomless carriers.

Sudden Death.—A series of budded trees of Valencia orange and Ellendale mandarin on rough lemon, *P. trifoliata* 22, Carrizo citrange, sweet orange and Emperor mandarin have been inoculated with *Coprinus* sp.

Black Spot (*Guignardia citricarpa*).—The spraying trial on twenty-four-year-old Valencia orange trees continued at Mangrove Mountain. Seven promising fungicide programmes were compared in a replicated randomised block layout. As well as information on control of black spot, details of yield, fruit colour, internal quality and external appearance were obtained.

Different strengths of zineb and maneb and combination programmes of these materials were compared with Bordeaux mixture. The standard Bordeaux-oil recommendation (2½-2½-100) was included for comparison. White spraying oil was used at sticker strength of 0.25 per cent with all materials, rather than 0.5 per cent as in previous years.

All of the programmes compared gave very good control. No loss of efficiency was evident with a reduction of white oil from ½ to ¼ per cent.

Zineb and maneb programmes produced fruit of excellent external colour and appearance, but juice and solids percentages were greatly reduced. They were below the legal minimum by mid-summer. The skin was thickened and flavour was insipid. A slightly weaker spray of zineb had less effect on juice and solids percentages but black spot control was also inferior.

Of the combinations of Bordeaux and zineb tested, Bordeaux mixture 5-5-100 (petal-fall) followed by zineb 0.25 per cent six and twelve weeks later produced fruit of excellent external quality without serious loss of internal quality. However, by comparison with untreated and with Bordeaux sprayed fruit the skin was somewhat thickened and the flavour somewhat insipid.

Bordeaux sprays at petal-fall were considered least responsible for skin injury. The third Bordeaux application was judged responsible for most of it.

A fungicides screening trial was continued at the Horticultural Research Station, Narara. The black spot control efficiencies of thirteen materials were compared with the three-spray Bordeaux programme. The fungicides concerned were phaltan, captan, ziram, Bayer 5078A, trioneb, maneb, polyram-combi, thiram, delan, NEP-64, cuprox, hydrated lime, copper oxydul and Bordeaux 5-5-100 followed by zineb aqueous applications.

The standard three-spray programme gave the best control. Bordeaux 5-5-100 + two sprays of zineb mist, copper oxydul, and cuprox + hydrated lime were comparable (9 per cent severe spot). Phaltan, captan and ziram failed to give adequate control of the disease. Only indifferent control was provided by programmes of trioneb, Bayer 5078A and maneb. Somewhat better control was obtained with polyram combi, thiram, delan and NHP-64.

The cuprox-hydrated lime spray, included to determine whether the hydrated lime would reduce rind injury, satisfactorily controlled black spot, comparable with treatments Bordeaux 5-5-100 + zineb mist x 2 and copper oxydul; and the fruit was larger, uniformly coloured, and relatively unmarked. This treatment will be in more extensive trials in the coming season.

The phaltan programme severely injured the rind and, as well, had little effect on melanose. Injury was of the droplet burn type. Captain caused similar injury and poor control of melanose.

On twenty-two-year-old Valencia oranges at Jilliby, on trifoliata stock and clay loam alluvium, twelve promising proprietary fungicide materials were compared with the standard Bordeaux recommendations for black spot control. Yield, fruit size, surface blemish and fruit quality data were also obtained.

A three-spray programme comprising Bordeaux mixture 5-5-100- $\frac{1}{2}$ white oil spray at petal-fall followed at six to twelve weeks after petal-fall by zineb (65 per cent) 2 lb./100 gal.- $\frac{1}{4}$ white oil was best. The fruit was excellent internally and externally, as was the yield.

The Bayer 5078A programme showed promise and will be further tested.

Dithiocarbamates tend to reduce juice content and to cause insipid flavour. This was more noticeable with the full maneb three-spray programme. It was less so when Bordeaux mixture was used at petal-fall followed six and twelve weeks by maneb sprays, but maneb caused a burn on some fruits when it followed Bordeaux.

Lime sulphur at winter strength (1-13) was applied to some trees in all treatment rows, and there was no incidence of leaf, twig or fruit damage.

Brown Spot of Emperor Mandarin.—Captan, melprex, glyodin, thiram, ziram and a combined treatment of cuprox-zineb were compared on four-year-old Emperor mandarin trees at the Horticultural Research Station, Narara. Four applications were made, commencing in the spring and extending to early April. Leaf infections were assessed throughout the autumn, and brown spot incidence on the fruit was determined at harvest in July when details of crop yield were obtained.

Melprex, thiram and cuprox-zineb (89-93 per cent clean fruit) gave best control. Ziram and captan (83 per cent clean) were next, then glyodin (60 per cent clean).

Greatest weight of fruit was produced on ziram trees. Thiram, glyodin and melprex programmes seriously reduced the crop. Captan and cuprox-zineb were intermediate.

Ziram and melprex gave best control of leaf and shoot infections; thiram, cuprox-zineb and glyodin followed in that order, and captan had no value in protecting the leaves and shoots.

Citrus Nutrition Experiment.—The citrus nutrition, pot experiment was continued at the Horticultural Research Station, Narara, in collaboration with Chemistry Branch and Division of Horticulture. Quantitative, third year harvest results have now been analysed and the overall three years results (1959-60-61) assessed.

Leaf contents of nitrogen, phosphorus, potassium, magnesium and copper consistently reflected the amounts of nitrogen, phosphorus, potassium, magnesium and copper applied; but for calcium this was true only in one year of the three.

Stubby Root Disease.—Finding of a nematode (*Trichodorus* sp.) associated with poor growth of citrus seedlings and stubby root symptoms in mature citrus trees, at Narara, has caused interest in the status of stubby root disease in New South Wales and its control. The species concerned here has yet to be determined but *T. christiei*, the overseas causal organism of stubby root, is reported overseas to be difficult to control chemically.

In early summer, 1962, an experiment was commenced at Narara, using soil drenches. Results six months after treatment show that nemagon (1,2-dibromo-chloropropane) and VC-13 (0-2,4-dichlorophenyl 0,0-diethyl phosphorothioate) have not reduced the *Trichodorus* population; but only one soil sample from vapam (Sodium n-methyl dithiocarbamate dihydrate) treated plots has yielded this nematode since the treatments were applied. Moreover, marked plant growth response to the vapam treatment was evident, both at Narara and in Narara soil in the glasshouse at Rydalmere.

Steps to eliminate nematodes from citrus stock before distribution from the nurseries was initiated; but surveys have shown that *Trichodorus* is already in coastal and some inland citrus areas.

There will be further work on this disease.



Root Nematode Control

There are citrus seedlings in each of the three pots of soil infested with the nematode *Trichodorus*. Left: no treatment; centre: soil treated with vapam prior to planting; right: soil treated with a DBCP drench prior to planting.

Diseases of Deciduous Fruits

Apple Black Spot (*Venturia inaequalis*).—Despite favourable conditions for the fungus in spring, early summer and autumn, control generally was satisfactory. Widespread adoption of eradicant post-harvest spraying with 0.01 per cent phenyl mercuric chloride contributed substantially to the avoidance of serious losses.

V. inaequalis Ascospore Liberation Studies.—These were continued at Orange, in association with Division of Horticulture Spray Warning Service. The first ascospores were trapped on 6th September, at early green-tip. The most intense ascospore liberation for the season was recorded on 20th September; the highest recording for September and the earliest seasonal peak since field spore-trapping with Hirst traps began here in 1955. Ascospore liberation was recorded on twenty days, from 6th September to 5th December. The last major flight was on 20th October.

At Orange the first light infection period was 15th-16th September, followed by a moderate one on 24th September. Heavy *ascospore* infection periods occurred 13th-14th October and again 20th-21st October. Thereafter: two *conidial* infection periods in October (23rd-24th-25th; and 28th), two in November (10th; and 21st), and three intense periods in December (3rd-4th-5th; 7th-8th; and 14th-15th). Recordings ceased on 15th December.

The first lesions were detected on 15th October, from the *ascospore* infections which occurred on 24th September. The first conidia were trapped on 23rd October and erratic catches ranging up to 48 conidia per cubic metre of air were made on nine subsequent days, some wet and some fine.

Eradication Dosages for V. inaequalis in Senescent Leaves.—In an experiment to determine the minimum effective dosage of phenyl mercuric chloride (P.M.C.) for eradication of *V. inaequalis* from heavily infected senescent apple leaves, all concentrations from 0.05 per cent to 0.005 per cent prevented the formation of perithecia. Some ascospores were liberated from two of the three samples treated at 0.0025 per cent P.M.C.

In another experiment heavily infected senescent leaves, collected as they were about to fall in autumn, were momentarily dipped in P.M.C. 0.01 per cent or 0.05 per cent immediately after collection. They were then subjected to leaching by simulated heavy rain on both upper and lower surfaces at times ranging from zero minutes to 240 minutes after dipping. After overwintering in fibreglass mesh bags, ascospore liberation from both of the non-treated samples was substantial. At both P.M.C. concentrations no ascospore was liberated from treated non-leached leaves or from treated leaves leached immediately after dipping.

In a similar experiment, PMC 0.01 per cent applied only to the lower surface prevented ascospore liberation from leaves which had been heavily infected on both upper and lower surfaces. Also, no ascospore was liberated from leaves treated only on the lower surface and leached with simulated heavy rain, either while still wet 30 minutes after spraying or when dry 60 minutes after spraying. It had been previously shown that PMC 0.01 per cent applied only to the upper surface reduced ascospore liberation by about 50 per cent.

In an inoculation experiment at Rydalmere, using mixed *ascospore* inoculum collected from several apple varieties at Orange and Batlow, potted trees of the newly released Red-bow and Bonza varieties of apple respectively developed moderate and light to moderate leaf infection. Under the same circumstances Granny Smith trees became severely infected.

Bitter Pit of Apples.—Occurrence of bitter pit in non-irrigated orchards in the Hills district during the hot, dry November of 1962 has made it necessary to amend the previous recommendation of a single spray of one per cent calcium nitrate in December. Two sprays, each of one half per cent calcium nitrate, are now recommended for dry conditions; the first early in November, and the second in December a few weeks before harvest.

Apple Bitter Rot (*Glomerella cingulata*).—In an experiment on Willie Sharp apples at Arcadia no infection developed in plots sprayed with captan, zineb, captan plus zineb mixture, dithianon or thiram. In the previous season the three had been heavily infected but in the interim had been well pruned and all mummified apples had been collected and destroyed. Over 25 per cent of the fruit on a nearby non-sprayed tree developed bitter rot but this tree had not been subjected to such methodical sanitation.

In a co-operative experiment with Division of Horticulture at Arcadia, captan and folpet were compared in four different schedules. There was no significant difference between the schedules, but folpet was the significantly better material. The schedules involved omission of certain sprays early in the season.

In a West Pennant Hills grower's experiment an entire block of Willie Sharp apples was sprayed with 0.01 per cent phenyl mercuric chloride in autumn. This was followed by various schedules:—Bordeaux mixture (10-10-100), 0.01 per cent PMC, or no spray, at green-tip, and then by dithianon, captan or CR3025 in the cover spray programme. Only a trace of bitter rot developed, under favourable infection conditions. The block had been heavily infected in the previous season. In the Arcadia experiments, and elsewhere, control by the protective programmes may have been materially assisted by the manual removal of sources of sporulation and/or the eradication or suppression of inoculum by a PMC spray in autumn.

In an Oakdale grower's experiment, large plots of Peasgood Nonsuch apples with a recent history of severe bitter rot infection were sprayed with captan, zineb or a mixture of zineb and captan. At harvest the captan plus zineb mixture appeared to have given the best result but this was not satisfactory. Estimated fruit loss was 20 per cent. Inoculum suppression had not been attempted in this orchard, and severe infection occurred during five days of continuous rain from 4th to 8th December. Protection by the previous spray application on 16th November had by this time become incomplete. The first lesions were seen on 25th December. Thereafter, in persistently wet, warm weather, infection progressed rapidly against an intense protective spraying schedule.

In laboratory inoculation experiments, *Colletotrichum gloeosporioides* isolates from apple and from Kalmia infected uninjured Granny Smith apples. Isolates from citrus leaves, grapes and Pilea did not. Granny Smith apples injured by needle pricks became severely affected by isolates from apple, Kalmia and grape but were only slightly affected by the isolate from citrus leaves.

At Oakdale, mummified fruit of the previous season were found in January to contain perithecia of *Glomerella cingulata* bearing mature ascospores.

Lime Sulphur Spray Effect on Apple Cropping.—In a 5 years' experiment at Glen Innes Agricultural Research Station a lime sulphur schedule for black spot control had significantly reduced fruit numbers by 16.8 per cent, harvest weight by 22.3 per cent and mean weight of fruits by 9.2 per cent, compared with results from a thiram schedule. Black spot infection was negligible in both treatments and had no influence on yield.

After those five years, all trees were uniformly treated with thiram for an additional three years. Although not yet statistically analysed the figures for these three years have indicated progressive yield improvement of the trees previously treated with lime sulphur. This experiment was co-operative with Division of Horticulture.

Virus Diseases of Pome Fruit.—Tests for transmission of a number of suspected virus diseases continued at Narara. Some trees were discarded and others retained for further observation. There are some as yet inconclusive signs of transmission.

Seventeen imported English apple rootstocks were examined. Most had some leaf mottling which might be due to virus infection. These stocks will be indexed for virus.

Unsuccessful attempts were made to free Jonathan apples from apple mosaic virus, and Gravenstein apples from apple flat limb virus. The methods involved tip cuttings grown under mist-propagation, and cleft-grafting of young shoot tips and budding of terminal buds on to apple seedlings. The experiments will be repeated, with and without heat therapy.

The Deciduous Fruit Tree Improvement Committee continued and, as a result of orchard surveys, some recommended budwood source trees were rejected. Continued visual examination of recommended budwood sources has now eliminated most of the trees showing symptoms of virus infection and a programme of indexing for latent virus infections will be executed. Suitable indicator hosts for this work are still being assembled. An adequate collection should be available during the coming season.

Orchard surveys by field officers, in conjunction with the Deciduous Fruit Tree Improvement Committee's work, have yielded a number of new records of virus and suspected virus diseases of pome fruit.

Diseases of Tropical Fruits

Stone Fruit Brown Rot (*Sclerotinia fructicola*).—In a West Pennant Hills experiment on Shanghai Seedling peaches, brown rot was effectively controlled by captan, captan plus glyodin and dithianon plus glyodin. These treatments did not differ significantly and allowed only 0.5 per cent, 0.8 per cent and 1.2 per cent brown rot respectively. They were significantly superior to captan plus tritan B1956 (5.2 per cent brown rot), allisan plus glyodin (14.3 per cent), brassicol plus glyodin (15.9 per cent) and no treatment (26.5 per cent).

Of those fungicides the best post-harvest control of soft rot (*Rhizopus stolonifer*) and total rots (brown rot plus soft rot) was provided by allisan plus glyodin, captan plus glyodin and captan alone. Their results did not differ significantly from each other, and they were the only treatments significantly better than no treatment for soft rot control. The experiment was co-operative with Division of Horticulture.

Peach Bacterial Spot (*Xanthomonas pruni*).—It was recorded this season at Uralla and Tenterfield on the northern tablelands. The two orchards concerned, plus one at Darke's Forest and one at Wedderburn, each south of Sydney, are the only locations other than Bathurst and Orange on the central tablelands where the disease is known to occur. In all, this bacterial spot of peach has now been recorded in 41 orchards.

Prune Rust (*Tranzschelia discolor*).—An experiment in co-operation with Division of Horticulture, on D'Agen prunes at Young, is determining the rust effect on yield and quality. The results have not yet been statistically analysed but there seems to have been no difference in total soluble solids content of mature fruit from rusted and non-rusted plots. There was a trend in the non-rusted plots towards higher yield and a higher proportion of larger fruit. The moisture content of dried "B grade" prunes was very variable, ranging from 11.4 per cent to 24.9 per cent. Samples of "B grade" fruit have been processed at Hawkesbury Agricultural College and submitted to the C.S.I.R.O. Division of Food Preservation for organoleptic assessment.

In another co-operative experiment on D'Agen prunes at Young, dithianon compared favourably with zineb plus oil for rust control when both were used at one half the usually recommended concentration. Dithianon at quarter strength was distinctly inferior but much better than no treatment.

Cherry Bacterial Canker (*Pseudomonas syringae*).—In a long-term experiment, begun in winter 1961 with Division of Horticulture, the value of working bacterial canker susceptible varieties high on a canker resistant frame is now becoming evident.

Although incidence of the disease was low, a few infected scions had died back to the stock. There canker progression ceased abruptly. A strong shoot then arose from the stock, above the crotch, in a position suitable for re-working to restore the tree.

Leaf Curl (*Taphrina* sp.).—A further attempt was made to study the effect of cross inoculation of *Taphrina* sp. isolates from peach and apricot onto potted Glengarry apricot and Aunt Becky peach trees. Spray and needle inoculations again failed.

At Bilpin, Bordeaux mixture, copper oxychloride, phenyl mercury chloride, lime sulphur and dithianon were compared for leaf curl control. No leaf curl developed on non-treated trees. No results were obtained.

Virus Diseases of Stone Fruit.—Mahaleb cherry trees which were subjected to heat therapy immediately after budding on to seedling Mazzard cherry stock in 1962 have shown no evidence of virus infection. These trees will be grown in the field next season for further observation.

To investigate the problem of cherry dieback and decline on Mahaleb stock, a supply of virus-free seed from indexed trees is to be obtained from the U.S.A. A statistically designed field experiment will then be set up, comparing the virus-free seedlings with local virus-infected material.

The Deciduous Fruit Tree Improvement Committee continued its work, and visual inspections of the recommended stone fruit budwood sources have eliminated a few more trees.

Due to the limited value of a visual inspection of these trees, and because a considerable number of stone fruit virus indicators are now growing at Rydalmere, a start has been made on indexing the remaining recommended cherry budwood trees. Inoculations have been carried out on indicator plants for 13 of the recommended sources of cherry budwood. Some results should be available during the 1963-64 season.

Banana Leaf Spot (*Mycosphaerella musicola*).—A significant advance this year in understanding the etiology was the finding of perithecia and spermatogonia of the causal fungus on older leaves and trash in all banana-growing districts.

An interesting feature of this disease is the way in which the distribution of spots on the foliage differs with the type of spore responsible for infection. The water-borne conidia are splashed, especially in dew, on to the spiral folds of the young unfurling heart leaf and give rise to spots arranged in lines roughly parallel to the leaf margin ("line spotting"). Ascospores are air-borne and in the mornings, when the dew is drying and there is little wind, these spores tend to drift upwards and reach the under-surfaces of the youngest open leaves. They settle all over but most densely towards the tips. As spots form first where the infection is heaviest, ascospore infection leads to characteristic "leaf tip spotting". The infection period this year was extended considerably by the wet weather from November to March.

Oil as a control continues to gain popularity, and this year 4,138 acres, 15 per cent of the acreage, was misted.

Banana Leaf Speckle (*Mycosphaerella musae*).—Although prevalent, the effects were overshadowed by the unusually severe incidence of leaf spot. There has been consistently good control in the past three years by either copper oxychloride, zineb or maneb, in 6-8 gallons of water per acre with a hand-directed misting machine, at three-week intervals from December to May. By adding white oil the development of leaf spot infections can be arrested. The semi-concentrate water-based programme is rapidly gaining popularity.

Banana Root Rot (*Radopholus similis*).—The burrowing nematode has been determined as the prime cause of root rot and, consequently, of insecure anchorage and unthriftness in stools. This nematode is introduced into new plantations by planting infested sets. A hot water plant was established in 1960 at Murwillumbah for bulk treatment of sets. This year 48,000 sets were treated, 74,000 less than in the previous year. This treatment achieves a high degree of root rot prevention. In an experiment at the Duranbah Demonstration Plot the yield was 22 per cent higher in the planting established from heat-treated sets compared with one established from infested materials. There have been some problems, through different tolerances of planting material to heat treatment.

Banana Bunchy Top (Virus).—Only 1,405 plants affected with bunchy top were detected in a total planting of 27,276 acres. Despite the longstanding achievement of low overall incidence as a result of the continued campaign, complete eradication is not possible under this system of inspectorial detection and destruction of infected plants.

Pineapple Decline (cause undetermined).—This condition, with nematodes *Pratylenchus brachyurus* and *Meloidogyne* spp. associated, appears to be the most serious problem in pineapple culture. The root system of affected plants is destroyed, especially in the winter. This leads to foliage yellowing, dieback, small fruit, and very low yields in ratoon crops.

Good control is being obtained with nematicides D-D or ethylene dibromide applied before planting and followed by nematicide DBCP 4-6 months after planting and before growth is resumed in the spring. Rapid build-up of the residual nematode population during the autumn and winter months makes the second nematicide application essential.

Passion-fruit Fusarium Wilt.—The study of *Fusarium* wilt of passion-fruit and development of a desirable resistant type continued. This project is co-operative with Division of Horticulture.

The breeding programme is using *Passiflora edulis* and the resistant *P. edulis* f. *flavicarpa* as parents. Progeny have been tested for resistance in the glasshouse and selected material has been planted out in infected soil at Kulnura. Selfing and back-crossing on to *P. edulis* with selected vines has proceeded.

Diseases of Grapevines

Downy Mildew.—As downy mildew infection did not occur until early January, results in the demonstration high volume spray trials at Orchard Hills, with the several fungicides and combinations, were inconclusive.

A guide to the sprays' residual fungicidal activity was obtained three months after the last application. Bordeaux mixture had the best residual activity. There was no defoliation and only slight leaf infection. Delan showed very good residual activity and copper oxychloride was only slightly

inferior. Zineb and maneb had only moderate residual activity, allowing noticeable leaf infection and some defoliation. Copper Curit (Copper oxychloride-zineb), CR3025 (a formulation of zinc and manganese ethylenebisdithiocarbamate), Polyam Combi and a zineb-T.M.T.B. mixture showed poor residual activity.

Grape Vine Bunch Stem Dieback.—In collaboration with Chemistry Branch investigations towards control of this disease continued.

Calcium chloride foliar sprays have been discontinued because of the leaf scalding in 1961-62. Calcium nitrate and calcium gluconate sprays were used in 1962-63, at 5 lb. per 100 gallons. Bunch stem dieback was moderately severe. There was no indication that the foliar sprays influenced the condition. A number of calcium and nitrogen soil treatments have been applied but results cannot be expected until the 1963-64 season.

Many chemical analyses of leaves and petioles collected at Orange were done through the season. These were compared with similar material collected from the same variety (Black Muscat) at Orchard Hills near Penrith, where the condition is not known. So far, no major differences in nutrient levels to account for the disease have been detected.

Diseases of Strawberries

Black Root Rot.—Cause and control investigations have recommenced. A species of *Rhizoctonia* has been commonly associated. Nematodes may also be involved. Several fungicidal and nematocidal soil treatments are being tested, for suitable control and to help elucidate the role of soil fungi and/or nematodes in the condition.

Diseases of Ornamentals

Root-rots.—Root-rotting fungi were again favoured by continuous heavy rain. Some plants normally considered resistant to root rots succumbed. Most notable was the heavy loss of fuchsias due to *Phytophthora* infection. Young cuttings and established mature plants were lost.

Orchid Diseases.—Numerous inquiries came from amateur and commercial growers, particularly about mosaic virus and fungus bulb rots. There were more specimens of orchids than of any other type of plant this year.

Preliminary tests of virus-infected *Calanthe* hybrids indicated that they may be infected with Cymbidium mosaic virus, not previously recorded on this host.

Rose Wilt (Virus).—Fewer records than in the previous year were received. The weather did not favour symptom expression.

Because some rose viruses have been demonstrated overseas to be related to certain stone fruit viruses, wilt-infected rose buds were grafted on to seedling apricots during the summer in an attempt to relate this virus to others affecting the family *Rosaceae*. Some buds are still alive and the plants will be examined for virus symptoms this spring.

Rose Black Spot (*Actinonema rosae*).—This disease was prevalent throughout the State, particularly in the summer. Phaltan gave excellent control at Rydalmere.

Carnation Flower Blight (*Botrytis cinerea*) and **Branch Blight** (*Alternaria dianthi*).—These two diseases were severe in a number of carnation crops. Wet weather made control very difficult.

Gladiolus Leaf Spot (*Botrytis gladiolorum*).—This was particularly severe in commercial gladioli crops around Ballina and Lismore following winter flood rains. A further outbreak occurred in metropolitan crops after heavy summer rain.

Powdery Mildews (*Oidium* sp.).—These were particularly prevalent on crepe myrtle, delphinium, ranunculus and roses. The disease was very severe on roses in the spring, especially on the young buds.

Iris Rust (*Puccinia iridis*).—Rust appeared for the first time on iris in two metropolitan suburbs late in spring. Twenty-two infected varieties were collected. No reports of it have been received from outside the metropolitan area.

Gerbera White Rust (*Albugo* sp.).—Several specimens of this disease came from home gardens but none from commercial growers. There has been no further work on control.

BACTERIOLOGY SECTION

Dairy Products Bacteriology

Cheese Starter Cultures.—This year 1,456 starter cultures were distributed to cheese and other cultured products factories in N.S.W. Supply of active lyophilised lactic acid bacteria has increased from 940 in 1960-61, 1,031 in 1961-62, to the present level. Increased use of this service by the industry reflects greater awareness of the need for high quality cheese production.

Culture propagation techniques aimed at minimising bacteriophage infection of the starter organisms remained the most needed advice area. However, specialist advice on general bacteriological quality in cheese production was in greater demand than previously.

Installation of bulk starter units has continued and this should result in better control over starter quality.

Staphylococci in Cheese.—Introduction of HTST pasteurising treatment of milk for cheese manufacture over the last two years has been followed by installation of flow diversion valves and automatic temperature-recording in many cheese factories.

With the completion of a study of longevity of *Staphylococcus aureus* in cheddar cheese, a survey of incidence of staphylococci in cheese imported into N.S.W. from overseas countries was conducted. Some 653 individual samples representing 75 different cheese types from fourteen countries were analysed. Presumptive isolation of staphylococcal types on solid media was followed by microscopic examination of stained pure cultures and examination for coagulase production. Six of the 193 cultures isolated were shown to produce the enzyme.

The physical and chemical condition of many of these cheeses were not good and in many cases reflected the cheese type. It was not possible to determine the percentage of cheeses manufactured from raw, heat-treated or pasteurised milk as required in N.S.W.

Butter Quality.—The biological quality of N.S.W. butter was comprehensively surveyed, and 604 butters representing weekly samples from 30 producing factories were analysed for total, coliform, casein digester, yeast and mould and staphylococcal counts. The results were forwarded regularly to Departmental field officers and factory management, to guide modifications in production techniques and to help locate sanitation faults.

Blue-vein Cheese Manufacture.—Research on blue-vein cheese production from conventionally pasteurised milk was conducted with support from the Australian Dairy Produce Board. Use of hydrogen peroxide and catalase for "pasteurisation" has been investigated briefly. Chemical bactericidal treatments instead of heat may convey advantages, in firmer curd structure. Use of iron salts to stimulate growth and sporulation of *Penicillium roqueforti* was not successful in vat trials.

Antibiotics in Dairy Produce.—The incidence of antibiotics in milk supplied to a processing plant has been studied jointly with the N.S.W. Milk Board. A total of 6,218 individual herd samples was assayed for antibiotics. There were 447 positives, representing 8.2 per cent of the volume of milk assayed.

Early in the survey, a positive incidence of 11.84 per cent (volume basis) was recorded. This dropped to 5.55 per cent (volume basis) soon after introduction of a farmer education programme. As the educational activity continued, the positive incidence dropped to around 2 per cent. A level of 1-2 per cent has persisted. The outcome of this research and extension work was a striking example of the value of farmer education to improve dairy produce quality.

That work has formed the basis for a much larger extension project devised to reduce mastitis incidence. The Bacteriological Section has participated in this by providing pictorial aids, specialist advice on quality and milk shed sanitation, and addresses to farmer groups.

Special Extension Services.—Talks were given to professional and technical groups on several occasions. An officer of the Section served in the Executive Committee of the Australian Society of Dairy Technology. He was a member of an expert panel at several of the Society's meetings, and functioned as Education Officer.

Soil Bacteriology

Distribution of Legume Inoculants.—Preparation of agar cultures of *Rhizobium* for distribution to Experiment Farms, District agronomists and the Soil Conservation Service was discontinued. This service commenced in 1914. It has been abandoned in favour of distribution of peat inoculants by a commercial firm.

The collection of strains of *Rhizobium* was maintained. Ten new strains were added.

Testing Commercial Legume Inoculants.—One hundred and eight commercial peat and freeze-dried legume inoculants were purchased in 17 country districts during 1962 and laboratory-tested for quality. The high standard apparent in the past two years has been maintained in this fifth survey. No unsatisfactory culture was detected and no report of suspected failures during the 1962 season was received from field officers.

A sixth and more extensive survey of the cultures being used for the current sowing season has been commenced. Preliminary results indicate that quality is again good but some unsatisfactory cultures have been detected.

Field Testing Strains of Rhizobium.—Field testing of commercial and promising strains of rhizobia for agriculturally important legumes was done again this year, for pooling with the information obtained by the University of Sydney.

The 1962 trial at Quaker's Hill yielded useful results. Pooled results were the basis for strain recommendations for commercial use in the 1962-63 sowing season.

A field trial for 1963 was sown at Cowra. The results are not yet available.

Testing Vetch Inoculants.—The project to devise rapid methods for laboratory evaluation of inoculants for large seeded legumes has continued. Experiments with vetch (*Vicia sativa*) and cowpea (*Vigna sinensis*) have been successfully concluded. Further work with lupin (*Lupinus* sp.) is in progress.

Pre-inoculated and Lime Pelleted Seed.—Tests on commercial pre-inoculated legume seed did not support claims that it would be satisfactory after storage, and farmers have been advised not to use it.

Recommendations were made for preparation and use of lime pelleted seed.

Bee Diseases

Twenty-one specimens were received for diagnosis of suspected disease. Of these, only two were diagnosed as infected with *Nosema apis*. One brood comb specimen was found to be infected with *Penicillium frequentens*.

Microbiology Lectures at Hawkesbury Agricultural College

The vacancy which resulted from the death of the Lecturer in Microbiology at Hawkesbury College in early 1962 has not yet been filled. Two bacteriologists have spent three days per week there to lecture and conduct practical classes in dairy and food microbiology. The opportunity has been taken to modernise the facilities and extensively revise the curriculum.

Entomology Branch

PASTURE AND FIELD CROP PESTS

Australian Plague Locust (*Chortoicetes terminifera*) Incidence.—Locust activity was light and very little control work was done. Only two generations occurred, from September to December, and from late January to April in some districts.

Overwintering eggs hatched in the southern border districts of Balranald, Moulamein, Deniliquin and Urana, but not extensively. Scattered hatchings, bands and loose flying locusts were reported from the central western districts of Coonamble, Coonabarabran, Molong, Dubbo, Forbes, and Condobolin. These caused no concern. In the southern portion of the Central Division, Narrandera and Wagga also reported mild spring activity. Further west a few hatchings occurred in the Hay district, and a moderate outbreak of hatchings followed by loose swarms were reported from Wilcannia.

Early reports of the second generation were received in January from Milparinka, Narrandera and Wagga. However, in February, a large number of districts reported extensive loose and scattered locusts. In the Western Division there was activity at Milparinka and both Wilcannia and Hillston reported loose travelling swarms. These may have resulted in the extensive light, scattered flying locusts reported from Wilcannia and Hay in March. The southern districts of Urana and Jerilderie reported an extensive build-up of swarms followed by egg laying and the locusts persisted until April. This was a localised heavy outbreak.

The Central Division districts of Coonamble, Dubbo, Forbes, Molong, Coonabarabran and Condobolin all reported autumn activity. Greatest concentration was on a line from Trangie, through Peak Hill, to Parkes and Forbes. Dense flying swarms occurred but not of outbreak magnitude. Some southerly drift of locusts also occurred. Further north some swarms were reported in the Brewarrina, Narrabri and Quirindi areas, mainly in March. Extensive, light to heavy concentrations were reported in the southern portion of the Central Division from Narrandera and Wagga during March and April.

Equation to Predict Locust Incidence.—Despite widespread light to moderate locust activity in autumn a large outbreak is not expected next spring (1963) in the Central Division. This prediction is based on the rather high rainfall figures for these districts in the 1961 and 1962 springs. The multiple regression equation used for this prediction does not however apply to the far-western and southern districts. These as stated earlier were also active in autumn.

The prediction equation derived from study of past outbreaks has been used for three seasons. Each time it has given a good approximation of the size of an expected locust population. However a season of intense locust activity has not yet been involved.

Past field observations have indicated that adult locusts in dense aggregations may behave in different ways in respect of flight behaviour and swarm movement. This has an important bearing on aircraft control techniques. Morphological phase differences may be associated or at least an indicator of these behavioural changes.

Locust Morphological Measurements as Behaviour Indicators.—Samples have been collected from field populations over a period of years. Various parts of each specimen are to be measured, viz: length of wing, length of hind femur, length of pronotum, and maximum width of head.

Known history of field collected samples will be correlated to phase status established by measurement, and the relative effects of environmental factors such as rainfall and temperature and the well-known effects of density will be investigated. Both are probably capable of modifying the structure of the insect in the same direction.

A statistical procedure involving discriminant function analysis will be used to separate the different factors. It is essential to have the maximum possible information about the samples collected and to collect samples from as many different types of populations as possible, e.g.: locusts from dense swarms whose parents had been in dense swarms, solitary locusts that have not been in swarms for at least two generations, and so on.

Spur Throated Locust (*Austracris guttulosa*).—For the second time on record there was extensive damage to ripening wheat in several north-western districts. The previous outbreak was in 1959. Inverell, Narrabri, Pilliga and Wyallda all reported damage in September, 1962. Quirindi, Manilla, Walgett and Narrabri reported continuing damage in October. Narrabri and Wyallda districts were worst affected. Thousands of gallons of insecticide were applied from the air in an attempt to control the locust.

Recently fledged adults were also reported to be numerous and causing damage to the heads of sorghum at Delungra during March, 1963.

This locust's role in stem damage to ripening wheat is not clear, although it is able to cause similar damage under enclosed conditions. The insect is not in excessively high numbers in years when extensive damage occurs.

Some local landholders believe that field mice cause the damage. Locust numbers seem relatively low, no swarms or flights having been observed. In a paddock where 20-30 per cent of all wheat stalks have been damaged each locust would need to have attacked a large number of stems.

Wingless Grasshopper (*Phaulacridium vittatum*).—As in the previous year this insect was not active over its full range but some areas reported heavy damage. The worst affected appeared to be Tumbarumba district. There such field crops as rape and swede turnips were badly damaged during February–March. Some central tableland areas near Orange and Oberon also reported damage to field crops and pastures. One unusual instance was a nursery plantation of several thousand extensively damaged *Pinus radiata* seedlings at Oberon in December, 1962. The southern tablelands Cooma–Nimmitabel–Adaminaby area is usually extensively damaged but seemingly due to the very wet season the grasshopper population was greatly reduced and there was little damage.

Field investigations continued in the Cooma–Adaminaby area. Inspection in November, 1962, revealed recently hatched hoppers. These were later than usual, probably due to cold wet weather early in spring. “Patches” of infestation were located in the same areas as those mapped the previous season, again indicating that certain parts of properties are prone to regular heavy infestation. There was again heavy summer rainfall and infestations did not develop as in drier seasons.

Dieldrin, fenthion, and dichlorvos were tested in a randomised block design, using portable mist blowers to apply the liquids. Fenthion granules were applied by hand. Dieldrin at 2 oz. active ingredient per acre, and fenthion at 6 oz. were highly effective. They gave kills of over 90 per cent whilst dichlorvos, at 3 oz. per acre was only partially effective and fenthion granules gave very little control under the conditions of plentiful feed and lush growth.

Red Legged Earth Mite (*Pentaleus major* and *Halotydeus destructor*).—These were later than usual, but the hatchings of over-summered eggs of *H. destructor* were complete by the beginning of July. Populations remained at about normal until the end of September, throughout the south-western slopes and the Riverina. Good rains fell over wide areas in August. These and mild weather promoted crop and pasture growth so that earth mite damage became of less importance. Little spraying was done after July. In some districts some spring sowings needed September spraying.

P. major also caused little concern although noted in several districts. Exceptions were the Mudgee district where oats and clover were damaged and in the Muswellbrook district where sprayings continued into July.

Alternatives to DDT for Red Legged Earth Mite.—Spray trials set up at Wagga Agricultural College in June, 1962, to evaluate possible alternatives to DDT showed after 38 days that only dimethoate, azinphos and demeton-s-methyl warranted further consideration.

These were then applied at $\frac{1}{2}$ oz. a.i. per acre in a second series in August. After 56 days dimethoate and azinphos areas were still almost free of mites and these materials were considered worthy alternative earth mite treatments where DDT use is undesirable.

Trials of treatment of sub-clover and lucerne seed with the systematic insecticides phorate (“Thimet”), thiodemeton (“Disyston”), dimethoate (“Rogor”) and menazon (Sayfos), immediately prior to sowing were established against *Pentaleus* in the Parkes district in May and against *Halotydeus* at Wagga in June.

White Fringed Weevil (*Graphognathus leucoloma*).—Losses again occurred over widespread areas. Lucerne is the crop most commonly concerned but other crops reported attacked were peas and carrots in the Glen Innes district in November, pumpkins and other vegetable crops sown into old lucerne areas in the Mudgee district in November, and germinating *Desmodium* seedlings at Murwillumbah in December. Various summer legumes attracted large numbers of adults in Grafton district in February.

Dieldrin effectiveness against adults was shown at Murwillumbah, and this material is now commencing to be used as a summer spray by lucerne growers in many areas. At Forbes a landholder used dieldrin emulsion in the spray irrigation system when adult weevils were noticed in his lucerne paddocks. Results of applications made in January were assessed on the large numbers of dead weevils immediately and for several weeks after spraying, and subsequent complete freedom from grubs in the soil.

Preliminary arrangements have been made to set up in co-operation with the Taree (Manning River) Research Agronomist a series of demonstrations of control measures. Further extensive investigations will be made at the same time. Manning River District has a history of heavy losses due to this pest and is highly suitable for the investigations.

Observations were made in a lucerne paddock at Canowindra in September, 1962. Part had been treated with dieldrin 0.1 lb. a.i. per acre, and part with dieldrin 2 lb. a.i. per acre prior to being sown to lucerne late in April, 1961. Part of the paddock had been left untreated. Counts in the untreated area showed an average of 2.75 grubs per square foot, while in each of the treated areas, the counts averaged 0.05 grubs per square foot. The dieldrin applied to the soil before sowing had given good reduction in grub numbers. There will be further larval counts in the spring of 1963.

Observations and experiments have shown that dieldrin soil treatments pre-sowing greatly reduce grub populations. The duration of protection has yet to be determined.

Black Beetle (*Heteronychus sanctae-helenae*).—There was no report of black beetle damage. Five adults specimens collected in Dubbo in September followed a previous incidence recorded when an adult was collected on a sports field in 1956. The insect is apparently established there. It is also now in Albury as evidenced by specimens that emerged from a lawn in September. Black beetle swarmings reported from Albury and neighbouring towns in November and December probably comprised the native species *Metanastes vulgivagus*.

Armyworms and Cutworms (*Noctuidae*).—Armyworms (*Pseudaletia* sp.) were in plague proportions in Tweed–Richmond district in March. Opportunity was taken to assess carbaryl, fenthion and DDT against them. Two rates of carbaryl (1 and 2 lb. a.i. per acre) and fenthion ($\frac{1}{2}$ and 1 $\frac{1}{2}$ lb. a.i. per acre) gave satisfactory control of armyworms for three days and were comparable in effectiveness with DDT. There was no significant invasion from untreated areas in the three days. Assessment beyond three days was not possible because larvae in untreated plots pupated or died from disease.

Cost is excessive at the rates used. Much lower rates would be needed before these materials would be complete alternatives to DDT.

Varied levels of damage were reported in most months from many districts:—Griffith, Deniliquin, Tumut, Finley, Albury, Cootamundra, Parkes, Gunnedah, Moree, Glen Innes, Lismore, Murwillumbah, Grafton and Taree. Pastures were most commonly reported damaged but linseed, irrigated cereals, broom millet, newly sown lucerne, oats, maize and sweet corn were also attacked.

Clover Root Weevil (*Amnemos* spp.).—Investigations were continued in co-operation with the University of Sydney.

The two perennial legumes *Desmodium uncinatum* and *Glycine javanica* likely to be important summer forage plants on the north coast are susceptible to the *Amnemos* larvae. *D. uncinatum* is especially so. A Wollongbar experiment to assess the influence of *Amnemos* control on yield of the two legumes suggested that *D. uncinatum* is the more favoured host and that *Amnemos* control would be important in growing it.

Severe *Amnemos* damage to subterranean clover sod-seeded into grass pastures has been rare in recent years. This has been due to the recommended practice of heavy summer grazing for grass control. It prevents early establishment of subterranean clover plants and minimises food and oviposition sites whilst *Amnemos* is at maximum egg laying potential.

A Wollongbar long-term experiment is aiming to determine whether insecticidal control of *Amnemos* is needed in subterranean clover pastures when grazing is properly managed. In this first year the results suggest that heavy summer grazing may obviate the need for insecticide.

Insecticides are used widely in N.S.W. against pasture pests, and dieldrin sprays and dusts were recently recommended against the *Amnemos* spp. Concern has been felt at widespread use of chlorinated hydrocarbon insecticides in grazing areas and the possibility of residues in the animal tissues and the milk.

Work has been planned to test alternative formulations and methods of application of dieldrin in an attempt to eliminate residue risks.

Lucerne Flea (*Smynturus viridis*).—Dimethoate, malathion and diazinon emulsions each at an 0.05 per cent active ingredient were compared for lucerne flea control in some lucerne at Baulkham Hills. Daily observations for the week after application indicated that all three gave almost 100 per cent initial mortality of fleas.



Rough Bollworm Threat to Maturing Cotton Bolls

Rough bollworm (*Earias huegeli*) continued to be the major pest of cotton in N.S.W. In field screenings of insecticides the carbamate group looks promising for control of cotton pests.

Lucerne Seed Wasp (*Bruchophagus funebris*).—Following earlier results at Yanco with fenthion 0.125 per cent for control of lucerne seed wasp, an attempt was made this year to define the optimum number and timing of the sprays. The lucerne flowered in November and wasp damage was less than in previous years, but reduction in damage from the untreated level (23.1 per cent) to that of the best treatment (8.2 per cent) increased by about 45 per cent the yield of seed. Timing of treatments was based on lucerne seed being very attractive to the wasp between eight and eleven days after seed set.

Bloodworms in Rice (*Chironomus* sp.).—They were in large numbers in some crops sod-seeded into old pastures, and there was damage where DDT or dieldrin was not applied. In crops sown into orthodox seedbeds there was little trouble, especially since most growers applied preventative measures.

Two series of trials were undertaken to establish the optimum control methods for chironomid midge larvae: (a) laboratory trials to establish the median lethal dosage for dieldrin and DDT against the bloodworms in water but without soil; (b) three small field trials using rice seed dusted with insecticide and handsown at the rate of 55 seeds per yard row.

In the latter, each replication was a row two yards long. Methyl cellulose was used to stick the dusts to the seed without loss. DDT, dieldrin and malathion were each applied at the rate of 0.5 oz., 1 oz. and 2 oz. a.i. per 100 lb. rice seed.

In an incidence of large numbers of bloodworms in a sod-seeded crop the best result was from DDT at 2 oz. per 100 lb. seed. In an orthodox seed-bed where there were very few bloodworms all treatments improved the number of tillers

and grain yields over untreated seed. DDT 2 oz. per 100 lb. seed was again the most effective. It gave an increase of 50 per cent in these small plots, but the reason for this increase in the absence of bloodworms was not apparent.

Cotton Insects.—Rough bollworms (*Earias huegeli*) continue to be major pests of the maturing bolls although this year the level of damage was a little less than in the previous three years at Yanco. Murray Valley crops showed far less damage by rough bollworm than M.I.A. crops but growers reported serious damage in previous years. February was again the month of most damage.

Common Bollworm (*Heliothis punctigera*) as in previous years attacked squares, flowers and later the bolls from December onwards. The pest was numerous in January and thereafter declined.

Combined activities of the common bollworm and rough bollworm accounted for about 30 per cent of the bolls remaining at harvest being damaged.

Carbaryl and endosulphan were again evaluated at Yanco for control of these two major pests of cotton bolls. Carbaryl at 1 lb. and $\frac{1}{2}$ lb. a.i. per acre gave improved control when compared with the standard DDT 1 lb. plus endrin 4 oz. a.i. per acre applied at three weekly intervals. Endosulphan at 1 lb. per acre was as effective as carbaryl $\frac{1}{2}$ lb., and endosulphan at $\frac{1}{2}$ lb. per acre equalled the DDT plus endrin standard.

About one third of the bolls remaining on the plants at harvest were attacked by rough and common bollworms. A feature in the trial area was that fewer bolls were attacked by rough bollworm than in other years.

In field screenings the carbamate group of insecticides looks promising for control of cotton pests. Of the other tested materials mevinphos, diazinon, phosphamidon and heptachlor did not impress sufficiently to be further considered for protection of developing bolls.

At Yanco, thimet applied to cotton seed before sowing gave protection against thrips.

In the north western cotton crops: insect pest populations were generally low in the Narrabri district and did not permit evaluation of insecticides in the screening tests; at Wee Waa, *Heliothis* larvae were numerous early in February and caused considerable foliage perforation. They were controlled by an application of DDT, but other treatments were less effective.

At Rydalmere an experimental crop was sown with seed treated with phorate or thiodemeton. It remained free of red spider infestation for ten weeks whereas plants grown from untreated seed were heavily infested. Aphids colonized plants from treated seed after six weeks.

Black Soil Scarab (*Othnonius batesii*).—A 200-acre wheat crop at Croppa Creek was destroyed during May-July, 1962. The paddock had been under *Sorghum alnum* for years.

A rough analysis of figures from sampling 16 separate populations in the Graman area from May, 1959, to May, 1963, showed that there had been a reduction in most populations since May, 1962.

The adult flight season lasted from 8th December, 1962, to 2nd January, 1963. The flights that occurred from 16th to 18th December and from 26th to 28th December, 1962, were the heaviest since 1958.

Larval, food plant preferences have been extensively observed and collected. Preferences in pasture grasses and crop plants are now being tested.

In a further experiment to see whether gravid female beetles have a preference for any particular soil type for oviposition, definite preference for heavy self-mulching soil was exhibited. This confirmed a similar 1961 experiment.

An experiment on effect of soil type on larval mortality showed that the soils favourable for larval survival were those favourable for oviposition except for the lateritic kraznozem.

The effect of population density on larval mortality was studied in an experiment set up in May, 1961. Mortality increased with initial density of larvae. Larval combat is suggested as the cause.

Records of "outbreaks" from the year 1880 to 1963 are being collated. It is apparent that numerically the species has fluctuated greatly between 1880 and 1940. Severe damage was recorded in 1890, 1902, 1918-20, 1934-35, and since 1950. Prior to 1940, the species was only "noticed" in drought periods. All "bad damage" has been in times of drought.

A further ten control trials were established during the year. Results of previous trials showed that a surface application of 8 lb. DDT and a subsurface ("sown") application of 4 lb. DDT per acre are still exerting a control influence on grub numbers. This is respectively six years and five years after application. There was a time lag of some 12-18 months before the effect became apparent, and it suggests that only newly hatched larvae are susceptible to this control influence.

A screening trial was designed to see whether the observed differences between parathion treated and non-treated wheat was due entirely to the direct action of parathion on the larvae or to direct parathion influence on germination and seedling growth.

Yield figures indicated no significant difference ($p=0.05$) between ethyl parathion and sodium di-hydro phosphate, but each was significantly better than di-menthyl parathion granules and dust, and attapulgite granules only. All treatments were significantly better than the untreated.

Pruinose and Related Scarabs (*Sericesthis pruinosa* and *Rhopaea* spp.).—Insecticides and 3 lb. of *Phalaris tuberosa* seed were sod-seeded into a *Rhopaea* sp. infested paddock previously a sown ryegrass-cocksfoot pasture. Most of the ryegrass and cocksfoot had been killed out by the scarab larvae. The insecticides used were: parathion, DDT, diazinon, parathion + DDT, all at 1 lb. a.i. per acre, parathion at 0.5 lb. a.i. per acre, and DDT at 4 lb. a.i. per acre. All were 24 attapulgite granule formulations. Meat meal was used as a "filler" so that insecticide rate per acre would be correct.

The trial was sown on 19th September, 1962, after a pre-treatment count. When the trial was sampled again in December, 1962, no treatment appeared to effect the grub population. However, early in June, 1962, when all larvae were second instars and close to the surface, the paddock except for a 20 ft. wide strip had received a surface dressing of 1 lb. of DDT per acre to control an infestation of *Oncopera* sp. The DDT was applied as 2½ per cent. attapulgite granules to pasture 1-2 inches high. It was not thought that this surface treatment would affect the scarab population, but when sampled in December there were twice as many scarab larvae on the untreated as in the DDT treated area.

The difference in pasture root growth was very definite. Cocksfoot and ryegrass plants in the untreated area had most if not all of their roots cut off just under the ground in typical scarab manner, whilst in treated areas the plants had very well developed roots.

No difference in pasture growth or density could be seen between the insecticide treated plots when inspected in May, 1963; but the 20 ft. wide strip which had not received the surface dressing of 1 lb. DDT per acre to control *Oncopera* sp. was easily discernible. Plant density on the strip was reduced by at least 30 per cent.

ANIMAL PESTS

Sheep Blowfly (*Lucilia cuprina*) **Insecticide Resistance Studies**.—Extensive studies have shown that *L. cuprina* remains susceptible to diazinon following laboratory insecticides pressure on susceptible, resistant, and field strains of flies. It has also withstood diazinon pressure in the field for five years.

The larval selection programme with diazinon on susceptible and dieldrin resistant strains has now reached 60 generations in each instance. There are no signs of development of diazinon resistance.

Some 80 field strains were tested in the past fly season for indications of diazinon resistance. No diazinon resistant flies were determined. Several individual lines were inbred to F_9 generations in case any possible resistance may have been due to a recessive gene, but no resistant flies were found.

Some 80 strains of larvae were assessed for dieldrin resistance during the last fly season from September to April. Resistant types were present in most strains but at reduced frequencies. As on previous occasions most of the larvae belonged to the primary sheep blowfly *Lucilia cuprina*, thus confirming the close host-parasite relationship between this fly and the sheep.

Field experiments were conducted during the warmer months in the Quirindi, Bunnan and Merriwa districts to ascertain the value of S.1751, Nemacide and Nankor as fly preventives. Diazinon was used as a standard. Also, untreated sheep were kept on the three properties selected for the trials. Each insecticide was mainly used at concentrations as follow: diazinon (0.02 per cent and 0.04 per cent), S.1751 (0.025 per cent and 0.05 per cent), Nankor (0.1 per cent) and Nemacide (0.06 per cent).

There were fairly severe fly waves in the late summer and the autumn, and 25 to 30 per cent strike in the untreated sheep. Under these conditions each chemical satisfactorily prevented fly strike over the 10 to 12 weeks of observation. Strike incidences in the treated groups varied from less than 1 per cent to 8 per cent. In general, diazinon and S.1751 were superior to Nemacide and Nankor.

To reduce costs of jetting sheep the diazinon strength was tried at 0.01 per cent. Normal jetting levels are 0.02 per cent for body and 0.04 per cent for breech strike prevention. The 0.01 per cent satisfactorily prevented fly strike.

In those trials the opportunity was taken to observe the effect of diazinon dry powder dressings (2 per cent diazinon) on larvae in active strike lesions. The opinion was formed that dry dressings must be thoroughly applied or pockets of larvae will persist.

Stable Fly (*Stomoxys calcitrans*).—No progress was made towards the solution of this troublesome pest. Fenthion 0.05 per cent spray was reported to be effective but a check of this with dairy animals as Muswellbrook showed it to be not so. In this work one side of each of several animals, including two bulls, were sprayed. No difference in fly numbers was observable between the treated and untreated sides of each animal.

Ciodrin, an organic phosphate, was tried on two additional cows with little indication of protective value.

DOMESTIC PESTS

Argentine Ants (*Iridomyrmex humilis*).—Based on the Argentine Ant Eradication Campaign experiment completed in 1959, a small unit was set up in 1962 for spraying operations to eradicate the ant in N.S.W.

Except for one infestation at Woonoona all reports of the ants have been in the Sydney metropolitan area. Of 244 areas of infestation all but 26 have been treated. At the start of the year the known area of infestation was estimated at 890 acres. During the year seven new areas totalling about 129 acres were found.

During the year 531 acres have been sprayed, in 13 infestations. Some were very large areas. Three of them, at St. Peters, Sydenham and Five Dock, comprised some 300 acres. Another three comprised 130 acres.

The areas located have been varied. Two factory areas sprayed, at Sydenham and at Erskineville, contained industries ranging from large food manufacturers to steel works and many small factories, as well as main southern railway line sections and houseblocks. Tip areas were sprayed at Smithfield and St. Peters. Only part of the St. Peters tip area was sprayed, the main object being to clear the ants out of the part adjacent to the Sydney Haulage Terminal and to confine the ants to the tip. The remainder of that area will be treated towards the end of operations. The other areas were mainly houseblocks, but a Canterbury infestation included a large section of the racecourse.

A great part of the areas treated were cover sprayed, as reflected in the heavy per acre rates of application. These ranged from 79 to 150 gallons per acre and averaged 120 gallons. Dieldrin was the insecticide, at 0.75 per cent, and 63,043 gallons were applied.

The Campaign's effectiveness will be assessed next summer, when the treated areas will be surveyed for signs of the ant persisting.

Houseflies (*Musca domestica*) *Genetic Studies of Resistance*.—Multi-resistant houseflies, resistant to DDT, dieldrin-BHC and diazinon, are being held as a type species for resistance studies. An officer of Geigy Australasia Pty. Ltd. working under Entomology Branch supervision has established that diazinon resistance is due to a single dominant gene.

The selection programme based upon exposure of adult houseflies of a homozygous diazinon resistant strain to the topical application of diazinon was continued through to generation 22 (May 1963). Increased tolerance occurred, amounting to a two-fold augmentation of the order of resistance. Prior to commencing the selection, 0.5 per cent diazinon was lethal to the flies. At the end of the programme an odd fly would tolerate 1.0 per cent diazinon (0.2 micro-litre per fly).

The order of resistance of the pressurised strain is about 20 times normal. For comparison: dieldrin and aldrin resistances are about 800 to 1,000 times normal.

Diazinon resistance in houseflies was diagnosed from Warringah Shire, Castle Hill and Kensington, after extensive diazinon use in garbage dumps, poultry houses and stables for the past two to three years.

Dichlorvos, in the form of fly cakes and liquid baits and as a spray, was again used at Seven Hills Poultry Research Station. Fly numbers were mainly held in check but the populations fluctuated in the warm months. The summer was relatively cool and flies were fewer than usual at the Research Station. Population upsurges were reduced by dichlorvos spraying sufficient to give 120 mgms/100 cubic feet in an experimental shed. Each case killed thousands of flies.

An interesting and perhaps unique observation was that of large numbers of houseflies developing from maggots infesting ripe berries of boxthorn (*Lycium horridum*) collected at Tamworth during a fruit fly survey.

Mistletoe Brown Tail Moth (*Euproctis edwardsi*).—Further studies were made. Active infestations occurred in much the same areas as in the previous year. Skin rashes from the urticating hairs of the caterpillars, cast skins, and cocoons were reported from an area extending from Parramatta to Penrith.

It was established that two generations may occur in a year, giving rise to skin rash problems in November-December, and again in January-March. The second generation develops much more quickly than the first.

The larvae feed mainly at night and tend to move down the trees for shelter during the day. However, this may be affected by type of tree, amount of bark on trunk and limbs, and temperature. A general wandering habit appears to occur when the larvae have demolished all food supply on one tree, or may be associated with a fully-fed condition before pupation.

On 7th September, three mistletoe clumps were lightly sprayed with 0.1 per cent DDT emulsion. Larval colonies sheltering at the base of the mistletoes were not sprayed directly. By 9th September, none of the larvae in the treated colonies remained healthy, some were observed to be dead and some badly affected. On 27th September all larvae from these colonies had disappeared while untreated colonies nearby appeared quite normal.

In November the larval population of the area being examined, at Kingswood near Penrith, appeared to have declined drastically due to natural causes. A polyhedral virus was suspected as one cause. However, active and healthy infestations were located in South Penrith.

Here, large numbers of well-grown larvae were observed at the bases of tree trunks. Others were in seclusion in soil under the crevice of the trunk of a tree whereon a large mistletoe was completely defoliated. Most larvae were at ground level but others were 5-10 feet up the trunks and one colony was located under the bark 15 feet up.

Three of these trees were micron sprayed, foliage only, with 1 per cent DDT emulsion. About 2½ gallons of liquid were used to cover the three large trees. These were inspected on 27th November and no live larvae were observed, whilst larvae were readily visible on untreated trees nearby.

Arctiid Moth Larvae Invading Buildings.—For many years there have been reports of vast numbers of hairy caterpillars sporadically invading buildings in the Sydney metropolitan area. These have mainly been caterpillars of the Arctiid moths *Eutane terminalis* and *Manulcra replana*. Mixed populations of these species have often been reported.

Unsuccessful attempts were made this year to breed collected larvae in cages and pots, using buffalo grass, algae and moss growths as a food supply. The larvae would not eat, and died. Large quantities of faecal pellets were invariably produced for the first day or so but this did not continue.

Faecal pellets were examined and large numbers of round cells and strands of algae were observed, as well as fungal spores and some hyphae. Mineral grains, including sand, were often numerous. There were rarely signs of higher plants except for a few pollen grains. Some pellets were placed in algal nutrient solution in late July, and on 7th November some were found to be supporting vigorous algal and fungal growths.

Whilst there is no direct evidence of the normal food supply of the caterpillars, the indirect evidence from faecal pellets suggests that they graze on algal growths on damp walls, fences, etc.

The moths pass through at least two generations in a year. The habit of invading buildings and climbing walls in large numbers was thought to be a search for pupation sites. This may be so, but accumulations of larvae on ceilings and walls have been observed with all instars present. No damage has been associated but their presence in thousands creates a nuisance in buildings.

STORED PRODUCT PESTS

Wheat Pests, General Comments.—The most notable development has been introduction of the Exports (Grain) Regulations, under which all export wheat must be certified free of infestation and all ships must be clean before wheat is loaded. These regulations emphasised the need for completely adequate control measures and continued research on wheat storage insect problems.

After the regulations were framed the Department of Primary Industry called a conference of entomologists concerned with the research and of state officers responsible for inspections. The meeting defined the present status of knowledge and practice in Australia and discussed research work in progress or which should be initiated.

Some general comments on the control position in this State should be made. The control programme of the N.S.W. Grain Elevators Board now depends on use of malathion for harvest treatment at bulkheads in the country and disinfection at shipping terminals. This is reinforced by hydrogen phosphide fumigation in country silos, and by hygiene.

Malathion has continued to give most satisfactory results in the country and at the shipping ports. Observations on treated wheat during the meal moth investigations reported in a later paragraph indicated virtually 100 per cent protection after five months storage, and Export and Import Branch Inspectors report good results at the terminals.

This continued use of malathion has necessitated a residues check on export wheat. Analyses have been done for the Grain Elevators Board by this Department and by William Cooper & Nephew (Aust.) Pty. Ltd. as well as by some of the importing countries. There have been considerable variations in the malathion residues, seemingly due to faulty spraying machinery. The Board is taking corrective steps.

Wheat Weevil (*Sitophilus oryzae*).—The trial, commenced in January, 1961, using replicated insecticide treatments in 44 gallon drums, was sampled late in September, 1962. Populations have been slow to build up. At this sampling the Bromodan, Sevin, pyrethrum-piperonyl butoxide and malathion treatments showed no living insects.

Of the treatments in this trial, only Sevin will be further evaluated. The chlorinated hydrocarbons must be excluded because of residue problem.

During May, 1963, an opportunity occurred to test wheat treatment rates of aluminium phosphate tablets. The dosage used in Australia in large bulk storages is commonly much lower than overseas recommendations. Rates of three and five tablets per ton were used, and compared with malathion at 12 p.p.m. Samples immediately after treatment showed 100 per cent kill in all treatments, and are being incubated to reveal the effect on immature stages.

Indian Meal Moth (*Plodia interpunctella*).—The Grain Elevators Board reported heavy surface infestations in silos and bulkheads in the Cowra Grenfell area, and that surface spraying with malathion and emulsion was not giving satisfactory results. A preliminary investigation was made with representatives of the Board in April, 1963. Some infested storages were inspected and where malathion had been previously applied there was new webbing together with moths and grubs. Thus, control was not adequate.

Overseas literature indicated malathion wettable powder to be superior to emulsion. To test this, and the value of other insecticides, trials were established at four storages in early May, 1963. Materials used were malathion, nankor, carbaryl and diazinon wettable powders, malathion, malathion-dichlorvos, and pyrethrum-piperonyl butoxide emulsions, and malathion and pyrethrum-piperonyl butoxide dusts.

Surface observations and grub counts in June, indicated that all treatments except malathion and malathion-dichlorvos have controlled existing infestations, and all treatments appeared to have protected clean bins against infestation.

Some observations on the extent of *Plodia* damage showed that it may occur to at least ten feet down in the bulk wheat.

Maize Weevil (*Sitophilus zeamais*).—In October, 1962, replicated malathion and lindane dusts treatments in shelled maize in replicated 1½ bushel storages were set up at Grafton Experiment Farm. This was to compare malathion with the existing lindane recommendation. The lindane treatments were at 5 and 10 p.p.m. Samples have been taken at about three monthly intervals. At the last sampling (June) all treatments have given good control of *Sitophilus zeamais*. Populations of *Cadra cautella* have developed in the malathion treatments, while the lindane treatments appear to be controlling this moth.

Bushel weight of the untreated material is now about 40 lb., while all treatments have maintained the original 56 lb. level. Sampling will continue.

Flour Insect Investigation.—Trials of local fumigation methods in flour mills continued, using a methyl bromide-ethylene dibromide (30:70) mixture. A series of fumigations was done to reduce the overall populations in the milling system.

Firstly all machinery was fumigated at the rates recommended by the manufacturers of the fumigant. This gave over 90 per cent mortality in boots and purifiers, scalpers, etc., less satisfactory control in the dust collectors and centrifugals and poor control in the rolls and conveyors. Machinery showing persistent population was retreated two weeks later at increased rates and over 90 per cent mortality was obtained in rolls where the feedplate had been cleaned before treatment. There was 75 per cent mortality in rolls where the plate was kept undisturbed. Better control was obtained on a large, textile filter-type of dust collector at the increased rate, but control was not satisfactory in one conveyor retreated.

Three weeks later a further sampling was undertaken, and all sites showing evidence of infestation were retreated. Sampling after treatment showed excellent control in rolls, boots, dust collectors and to a lesser degree in the conveying system. Control was less satisfactory in purifiers, centrifugals and scalpers.

These trials have shown that spot fumigation can significantly and valuably reduce insect populations in the mill machinery. It must be combined with adequate cleaning and insecticide application. General condition of this very old mill suggested that these measures had not been adequately fulfilled. This and the fact that the mill was never run dry prior to fumigation may have reduced the effectiveness of spot fumigation treatments.

Trial of a co-ordinated control programme incorporating a spot fumigant is the logical next step in this work.

Fumigation of Packaged Foods.—Some laboratory tests of the effectiveness of ethyl formate as a fumigant of packaged foods have been done. Although this chemical is widely used in the retail grocery trade and the dried fruits industry, experimental evidence of its effectiveness is slight.

Trials were carried out in three types of package: flour, milled baby food, and a rice and pressed semolina mixture. *Tribolium castaneum* and *Oryzaephilus surinamensis* were used as test insects with the first two materials and *Sitophilus oryzae* and *Rhyzopertha dominica* for the rice mixture.

At 10 mls. per cubic foot, the approximate rate for dried fruit treatment, very low mortalities occurred except with *O. surinamensis* adults. At 50 mls. per cubic foot there were 100 per cent control of adults and larvae of *Oryzaephilus* in the baby food and of *Rhyzopertha* in the rice mixture; and over 95 per cent of *Tribolium* adults in the baby food and of *Sitophilus* adults in the rice mixture. No *Rhyzopertha* or *Sitophilus* emerged from infested wheat mixed with the rice after one month incubation. Results in the flour packages were very poor; probably due to difficulties in fumigant penetration and the presence of only a paper-outer.

At 100 mls. per cubic foot there was 100 per cent control of *Tribolium* adults in the baby food.

FRUIT TREE PESTS

Yellow Citrus Rust Mite (*Phyllocoptura oleivora*).—A large spraying trial against yellow rust mite at Somersby in 1962-63 showed that dispersible sulphur (2½ lb./100 gal.) or zineb (1 lb./100 gal.) applied on November 14 prevented early build up of infestation on the new fruits, although this infestation had not caused much fruit blemishing by the time of the next applications. These were on December 27-28, at the white wax scale control time.

From these latter applications, zineb (1 lb./100 gal.) in white oil 1/50 gave an outstanding result, with no fruit blemish and no reinfestation by early April. Ethion 0.06 per cent-in-oil 0.9 per cent and chlorbenzilate EC 0.05 per cent in white oil 1/50 each gave no fruit blemishing, but some reinfestation occurred by early April. Carbaryl WP 0.1 per cent in white oil 1/100 had some value. Imidan EC 0.03 per cent in white oil 1/100, and malathion WP 0.1 per cent in white oil 1/100 had no value.

Citrus Gall Wasp (*Eurytoma fellis*).—This insect extended its range in County of Cumberland and was also extensive in Woy Woy and Gosford backyard infestations. No commercial planting of citrus was involved. A vigorous eradication campaign has been undertaken in the Gosford-Woy Woy area.

Surveys in County of Cumberland showed that the parasitic wasp *Epimegastigmus* is widespread. It is associated with gall wasp infestations in most parts of the area where gall wasp infestations are known.

Field tests of various systemic insecticides as sprays or as soil drenches showed little promise of success. Some fumigation trials were carried out during the spring, using two year old infested common lemon seedlings, to develop a treatment to sterilize nursery citrus trees against gall wasp. Ethylene di bromide was promising, at practicable rates and times. HCN fumigation was not promising.

Newly dug lemon, and Valencia and Navel orange trees were fumigated with EDB and replanted as a check on phytocidal effects of EDB fumigation. The highest dosage rate, 1½ lb. of EDB/1,000 cu. ft. at 70° F, affected the navels severely, but not the lemons or valencias.

Broad Mite (*Hemitarsonemus latus*).—Broad mite infestation and damage of the young fruit of Valencia oranges and lemons was seen at Terrigal from late December to March. Imidan EC 0.2 per cent + white oil 1/100, and Kelthane WP 0.03 per cent + white oil 1/100 were used in late December, before infestation built up on the Valencias. They did not prevent infestation. The Imidan treatment was relatively ineffective against mite infestation already established on the lemons, but the ethion and Kelthane treatments gave a good contact kill. Kelthane appeared to have residual effect for some weeks.

Growers' use of both ethion-in-oil and Kelthane was checked. Single applications of either material in January did not prevent heavy re-infestation by March. Two applications of Kelthane may have been adequate. Infestation declined in March.

The occurrence of both *H. latus* and *Phyllocoptruta oleivora* as separate infestations on adjacent lemon trees allowed in April a clear comparison of the types of fruit blemishing. *H. latus* injury was a silver-white sharkskin blemish, especially on the undersides, and confined to intermediate-crop fruits set out January. The *P. oleivora* injury, where recent, was a purple stippling, especially on the undersides, and a grey-brown sharkskin blemish where the injury was older. Main-crop were affected severely, as well as intermediate-crop fruits.

H. latus has been regarded as mainly a pest of intermediate-crop lemons, but a Terrigal Valencia orchard has suffered severe main-crop blemishing for the past two seasons. Significant blemishing on main-crop Emperor mandarins has been seen also, at Glenorie and Kenthurst.

White Wax Scale (*Ceroplastes destructor*).—Narara and Kulnura experiments demonstrated good white wax scale control, in a season when the general grower results have been unsatisfactory. Growers' applications are the main reason for the difference.

The standard recommendation for white wax control on the central coast is white oil 1/50. White oil—organic phosphate (malathion, rogor, ethion) combinations have been shown to be generally more effective, but not sufficiently to justify their extra cost. Their unsatisfactory or doubtful compatibilities with Bordeaux mixture are further disadvantages. Ethion has the special advantage of being useful against rust mite; unfortunately the new material Imidan does not have this advantage.

Kulnura results have not yet been collated fully, but it is apparent that carbaryl w.p. 0.1 per cent plus white oil 1/100, and Imidan w.p. or e.c. 0.5 per cent plus white oil 1/100 have given an excellent result. The ethion 0.75 per cent-in-oil 1/80, and the 1/50 white oil treatments have given results which are satisfactory, although not as good. Effectiveness of Imidan, carbaryl and ethion-in-oil were impaired by combination with Bordeaux mixture, but not by combination with zineb. The Imidan w.p. 0.05 per cent plus X77 treatment was quite unsatisfactory.

Narara results have not yet been finalised, but visual assessments indicate: Vamidothion quite unsatisfactory; carbaryl plus white oil excellent; Imidan 0.05 per cent plus white oil 1/100 good, but the other Imidan applications not so good; dimethoate plus white oil 1/100 good; ethion-in-oil better at 1/70 than 1/100.

Citrus Rust Thrips (*Chaetanaphothrips orchidii*).—Its damage to citrus fruits appears identical with that of the banana rust thrips (*Scirtothrips signipennis*). It has severely blemished citrus in parts of the Wyong district and more recently damaged oranges and lemons at Terrigal.

Dispersible sulphur (2 lb. and 4 lb. per 100 gal.) and dieldrin EC 0.05 per cent and 0.025 per cent were used in the petal-fall Bordeaux on Valencia oranges at Jiliby, in an attempt to prevent the stem end damage of new fruit. However, no information was gained as this early infestation did not occur in affected Jiliby orchards last spring.

Infestation on the fruits was developing during February, as new fruits commenced to touch. On February 18, single rows, each of 15 Valencia trees, received ethion 0.075 per cent-in-oil 1/80, carbaryl WP 0.1 per cent plus white oil 1/100, malathion WP 0.1 per cent plus white oil 1/100, dieldrin EC 0.05 per cent or dieldrin EC 0.25 per cent. Each application was combined with zineb (2½ lb. per 100 gal.). At the end of March the general infestation was not high enough for convincing observations, but all sprayed rows did seem freer of thrips than nearby untreated trees.

Red Scale (*Aonidiella aurantii*).—Red Scale was active through the summer in the M.I.A. Growers made more concerted efforts in light of the Department's new recommendation of dimethoate plus oil, as well as ethion in oil. Commercial control was very good.

The 1961-62 Yanco spraying experiment ended with infestation estimates in November at harvest. The treatments had been applied in February. Most successful was dimethoate WP 0.05 per cent plus white oil 1/100, then dimethoate WP 0.025 per cent plus white oil 1/100 and ethion 0.08 per cent-in-oil 1/70. Each was better than carbophenothion WP 0.05 per cent plus white oil 1/100. The wetting and spreading agents glyodin, X77 and Mobilcer M were not satisfactory substitutes for white oil in combination with carbophenothion. Imidan 0.05 per cent (as EC and as WP) plus white oil 1/100 showed little promise.

Preliminary results from the 1962-63 Yanco trials indicate best results from dimethoate—white oil, or ethion-in-oil sprays; superior to malathion—white oil, or dimethoate plus a non-oil sticker. Phosphamidon—white oil, or dichlorvos—white oil combinations showed little promise.

Blossom Thrips and Fruit Yield/Fruit Blemishing.—In the M.I.A., navel orange trees 45 years old were sprayed with dieldrin at early bloom and with malathion at full bloom to control blossom thrips, and in another treatment azinphos was used to suppress rind damage by the light brown apple moth.

The trees have yet to be harvested but sample counts have indicated that fruit set was not improved by thrips control and have shown no reduction of skin marking. Other observations indicate the importance of wind and consequent fruit movement in blemishing fruit.

Grape Bunch Mite (*Brevipalpus californicus*).—In Coomealla district, Lower Murray, good control of the grapevine bunch mite in the Gordo Blanco variety was obtained with spray programmes incorporating sulphur as the only miticide or with Kelthane replacing sulphur from November onwards. The fungicides Ziram and copper oxychloride gave no control. Mite activity and damage were most noticeable in January and February.

Banana Beetle Borer (*Cosmopolites sordidus*).—An experiment was begun in 1963 at Tomewin, Tweed River, to assess heptachlor and Ronnel under plantation conditions. Treatments were heptachlor ¼ and 1 lb. a.i. per acre (emulsifiable concentrate formulations) heptachlor 1 lb. per acre as a dust in fertilizer, dieldrin e.c. ¼ lb. per acre and Ronnel e.c. 1 lb. per acre.

Post treatment estimates, 1, 3 and 4 months later, suggested that Ronnel is ineffective against beetle borer but the three heptachlor treatments were comparable in effectiveness with the currently recommended dieldrin treatment.

Oriental Fruit Moth (*Cydia molesta*).—Infestation of canning peach varieties was heavier than usual where control measures were not applied from early in the spring. Damage assumed greater importance because of the canneries' strict enforcement of standards against oriental fruit moth damage. Much of the damage is hard for growers to grade out economically. Most of the entries are along the stalks, where entry is not easily detected. Some farms got very good control by using azinphos or carbaryl.

Timing schedules were evaluated, using carbaryl on Golden Queens (mid-season peach harvested in February/March) and Pullars Cling (late March/April) under moderate to light infestation conditions. A schedule of sprays applied from petal-fall at three-weekly intervals was best (2.3 per cent damaged). Schedules based on a first application at shuck-fall gave almost the same results. Where the first spray was delayed until December the damage was greater.

In an orchard that was unsprayed in 1959-60, with several peach varieties, counts were made in the 1962 winter of pupa cases formed in the 1961-62 summer when azinphos was used. The figures reveal continued reduction in number of laterals bearing summer cocoons—from 18.2 per cent in 1960 to 8.3 per cent in 1961 and 3.8 per cent in 1962.

San Jose Scale (*Quadrastipidiotus perniciosus*).—In the M.I.A., dormant sprays followed where necessary by sprays in the growing season have given good control. Wherever the programme was not well executed San Jose build-up was quick towards the end of summer.

Carbaryl 0.1 per cent plus white oil 1 in 100 applied in the spring gave excellent control on peaches and pears. This confirmed the previous year's M.I.A. results. Where carbaryl 0.1 per cent plus oil was used on Golden Queen peaches at full bloom there was no ill-effect.

As dormant and semi-dormant sprays carbophenothion, ethion-in-oil, and superior dormant oils at 3 gallons to 100 gallons were very effective as was white oil at strengths of 3 gallons to 100 or stronger. Lime sulphur at 5 gallons to 100 and also plus white oil 1 in 100 again gave standard results. Imidan 0.05 per cent plus white oil 1 in 100 was not satisfactory.

A State-wide survey was conducted at the request of Australian Agricultural Council, San Jose Scale was found in widely scattered areas on pear, prune, plum, peach and cherry trees. Apricots were notably free of infestation. Other hosts were Osage orange and some deciduous ornamentals. Scale infestations on *Eucalyptus* sp. were found not to be *Quadrastipidiotus perniciosus*. No other species of *Quadrastipidiotus* were found during the survey.

Frosted Scale (*Eulecanium prunosum*).—Poor control with superior oil on prunes in the Young district was reported during the 1961-62 season. In 1962-63 an experiment was done there on d'Agen prunes. Superior oil 3-100 was compared with two formulations of ethion in oil, one containing 2 per cent ethion in superior oil and used at 2-100 and the other containing 6 per cent ethion in oil and used at a concentration of 1-100, applied on two different dates: 31st July, when the trees were dormant, and 29th August, when the trees were at early budswell. Each treatment gave very good control. Apparently grower failure to get control with superior oil was due to imperfect methods and/or insufficient spray.

In the M.I.A. an unusual number of farms had heavy infestations early in summer but malathion or malathion plus oil checked development of the young scale.

Red Mite (*Bryobia arborea*).—Poor control with superior oil on prunes in the Young district was reported during the 1961-62 season. In 1962-63, on d'Agen prunes, superior oil 3-100 was compared with two formulations of ethion in oil, one containing 2 per cent ethion in superior oil and used at 2-100 and the other containing 6 per cent ethion in oil and used at 1-100, applied on two different dates: 31st July when the trees were dormant, and 29th August, when the trees were at early budswell. Each treatment gave very good control of red mite eggs. Grower failure to get control with superior oil was due to imperfect methods and/or insufficient spray.

Dried Fruit Beetle (*Carpophilus* spp.).—This was less important in peaches than it had been in recent years, but it did damage peach varieties such as Youngs with definite suture

lines. Occasional grazing by the beetles along the sutures tends to escape notice but it allows disease organisms to enter. Considerable injury was reported on some later peach varieties in County Cumberland.

Codling Moth (*Cydia pomonella*).—Azinphos and carbaryl continued to give excellent commercial control in the M.I.A. and tableland areas. Regular applications remove the pest from major role but where the control measures are not taken the damage is considerable. There was no project specific to control of this pest this season.

Woolly Apple Aphid (*Eriosoma lanigerum*).—Testing of systemic insecticides continued at Orange. In one trial, on heavily infested Delicious apples, the tested treatments were: lindane 0.1 per cent at green tip; menazon 0.02 per cent; mevinphos 0.047 per cent; dimethoate 0.0375 per cent; and vamidothion 0.05 per cent. Each of the four systemics was at concentrations which gave a spray priced at about 35s. per 100 gallons. The trees carry considerable root infestations and for many years have been very difficult to keep free of infestation during the growing season.

The vamidothion treatment was outstandingly effective. It kept areas free of infestation for the entire season. Based on length of protection the descending order of effectiveness of the other treatments was: menazon, dimethoate, mevinphos, lindane, and untreated. No phytotoxic effect was noted.

In an identical experiment in another "problem block" at Orange the trees were Granny Smith. The treatments were planned for late November but had to be deferred until mid-January because of late aphid build-up. No reinfestation occurred on trees sprayed with either vamidothion or menazon and only slight reinfestation with dimethoate. Lindane and mevinphos allowed appreciable reinfestation, but were a lot better than the untreated.

In an experiment on Delicious, vamidothion 0.05 per cent was applied in mid-January by automatic airblast machine and compared with handgun application. Hand-sprayed trees remained free of infestation for the entire season, whereas three out of six air-blasted trees were slightly infested late in April.

Red Spider (*Tetranychus telarius*).—A comparative spraying trial was done on Delicious apples at Orange. Treatments were: tetradifon emulsifiable 0.02 per cent; Kelthane emulsifiable 0.03 per cent; Aramite 0.025 per cent; azinphosethyl



Red Spider Research

Cultures of red spider grown on bean leaf sections in a constant-temperature room are used for biological and miticide-resistance studies.

0.05 per cent; vamidothion 0.05 per cent; Morocide 0.05 per cent; Eradex 0.05 per cent; UC20047 0.05 per cent; and Bayer 5024 0.075 per cent. There was no phytotoxic effect from any.

The organic phosphates vamidothion and azinphos-ethyl gave some control but were much inferior to all other treatments. This particularly applied to azinphos-ethyl, and indicated a degree of phosphate resistance.

Tetradifon and Kelthane were best, with tetradifon the better. Reinfestation did not become important on any tree sprayed with tetradifon, and at the end of the trial there was an average of only 3.5 spiders per leaf.

The two carbamate materials Bayer 5024 and UC 20047 ranked next in order of effectiveness, while Aramite, Morocide and Eradex were slightly inferior to these.

In a comparison of air-blasted and hand-gunned tetradifon 0.02 per cent and Kelthane 0.03 per cent the hand spraying was again outstanding. Even so, air blast application of tetradifon was also very effective and this finding is supported by grower use. Kelthane was less effective and its results were so conflicting as to suggest some resistance, a subsequent investigation has not confirmed this.

In the 1962 winter the control of red spider during dormancy was investigated at Orange. Trees carrying heavy overwintering populations were first cleaned of all trash, fallen leaves and loose bark to expose spiders, then sprayed late in August with superior oil 1-30. It prevented damage to young leaves and blossoms but did not significantly delay late spring build-up. This was probably because it had not been practicable to remove all shelter from large trees.

Red spider material from a Nashdale orchard, near Orange, suspected of being resistant to Kelthane, was laboratory-tested at the Rydalmere Science Service Laboratory. The tests revealed a very poor level of control with 0.03 per cent Kelthane, but virtually complete mortality when the concentration was increased to 0.06 per cent. The finding was vigor-tolerance and not true resistance.

In the present season there was very poor control in an orchard near Orange despite a very adequate Kelthane spray programme. The probability of resistance in this case is now under test at Rydalmere.

Biological comparisons of a carmine strain of red spider from cucumbers at Gosford and a green strain from apple trees at Orange has been undertaken. Each was cultured on to bean plants in a laboratory and maintained under identical conditions.

The colour of all progeny was the same as that of the parent culture. Eggs from the reddish strain had a slight tinge of red when deposited and those from the green strain were creamy-white. Considerably more eggs were deposited by the green than by the reddish females. Time of development from deposition of eggs to mature mites was identical.

Only males resulted from crossing ten red females with green males, and when ten green females were crossed with red males two produced both male and female offspring and the other eight males only.

Queensland Fruit Fly (*Dacus* (S.) *tryoni*).—Male-fly incidence was reduced by commencing the protein-malathion baiting late in August. But it had little significance in terms of fruit infestation by females in the October-November period. This was shown by the similarities of infestation rates in peaches at the first sampling from both the treated and untreated towns, Richmond and Windsor. That was in the last week of November. The infestations were attributed in the main to females which had overwintered in one form or another. After this first fruit-sampling the effect of regulatory work became more pronounced.

Also in the 1961-62 season, baiting that had commenced in December, 1961, had made no significant difference in peach infestation rates as between the towns. Thus, it now is reasonable to attribute to regulatory activities a major part of the favourable effect of the trial at Richmond this season.

The 1962-63 season was not one of generally severe waves of fruit-fly. Therefore, for greater reliance on the lure approach it is clear that increased dosage, and a greater area treated and deeper penetration of the area, than have been so at Richmond, are needed. And at the insecticide levels used there it would seem that baiting should commence well before August.

A factorial experiment commenced in 1961-62, and designed with the C.S.I.R.O. and Union Carbide Aust. Ltd. to evaluate male lure and protein-malathion baits, has been continued. From late October, 1961, protein-hydrolysate and malathion have been applied fortnightly in the six towns concerned. As in the Richmond trial, the basic method has been drive-past jet-spraying. Since the 1961-62 season shrubs or trees at intervals to average twenty linear feet of drive-past have been selected for the deposits. This meant a dose rate of about 15 grams per acre of each active ingredient, averaged over about 4,000 acres. However, for part of the 1962-63 season this rate was increased by about 25 per cent through greater penetration into backyards, etc.

The male-lure treatment was applied by sheep drench gun monthly from August to October, 1962, as in the previous season, on grids 50 yards square, in the six towns concerned. The dose at each point on the grid was placed preferably on the rough bark of trees but also on fence-posts, etc. It comprised 10 ml. of alcohol solution containing $\frac{1}{2}$ gm. of the lures: 1-p-hydroxyphenyl butan-3-one; 1-p-acetoxyphenyl butan-3-one; and $\frac{1}{2}$ gm. of the organic phosphate insecticide DDVP. As shown by parallel trial these deposits on certain surfaces would provide considerable residual activity. However, as the parallel trials had shown cane-ite to be a good standard carrier for these baits, and to economise on labour in the fruit-sampling season, small cane-ite blocks containing $\frac{1}{2}$ gm. of each of the male fruit-fly lures and insecticides DDVP and malathion were distributed on the basis of a grid approximately 50 yards by 30 yards. These cane-ite blocks were 2 in. x 2 in. x $\frac{1}{2}$ in. and were nailed at positions selected as in the case of liquid lures.

To assess effect, four fruits were taken on ten occasions from early December to early April from each host that ripened susceptible fruit. The samples comprised mainly stone and pome fruits but also tomatoes and some figs, pomegranates and persimmons.

In main effect, either treatment and the combined treatments gave improved fruit-fly control significance at the 0.01 per cent level compared with the no-treatment towns. The combined treatments gave improvement over the male-lure significant at the 0.05 per cent level but no significant difference showed between other pairs of treatments.

Trials in the Sydney area to provide information for possible use in the parallel, Western Towns Experiment, and others, have shown that:—

- (i) One gm. dosages of DDVP and the mixed hydroxy and acetoxy male lure, applied to about one square foot of the fibrous bark of native trees and compared with the same dosage on 4 in. x 3 in. x $\frac{1}{2}$ in. cane-ite pieces, were at least as attractive to male fruit-flies as were the cane-ite pieces for the period from 29th March, 1962, to 20th August, 1962, and were about as attractive for another three months, whereafter the treated cane-ite pieces exerted greater attractance.
- (ii) A mixture of DDVP and malathion on cane-ite with the mixed hydroxy and acetoxy male lure was superior to the insecticides DDVP and Dibrom used singly with these attractants, during ten months observation of the flies caught in tin-traps.
- (iii) Of a range of forms of malathion or DDVP with the hydroxy male lure at the 1 gm. dose on cane-ite in tin traps, after a period of three years the premium grade of malathion and the technical DDVP remain superior. The DDVP advantage over malathion declines with passage of time. In the first eight months considerably more male flies were taken in DDVP tins.
- (iv) There is promise of improved long-term efficiency of a DDVP hydroxy-male lure when applied as a liquid to eucalypt timber. Telegraph pole sections were treated either with an alcohol solution or a water emulsion of toluene and emulsifier JB500HF, or with the emulsion to which Aroclor 5460 had been added in the proportion of four parts to one of DDVP. One square foot of pole surface received $\frac{1}{2}$ gm. of both the insecticide and the lure. The pole-pieces, in a citrus orchard, were laid out on top of fly-retaining trays, placed 20 ft. apart in the form of a 3 x 3 Latin square. Results over the first three months showed male flies' preference for the alcohol solution treatment. A count after six months showed in favour of the deposit containing the resinous Aroclor 5460.

The Fruit Fly Suppression Scheme was continued in the Murrumbidgee Irrigation Areas, as in the nearby towns Narrandera and Hillston.

Protein yeast hydrolysate and malathion are supplied at least fortnightly in the M.I.A. and in Narrandera, using a mobile misting unit to drift the bait through trees in the streets and adjoining gardens. In Hillston a mobile dilute sprayer is used. The bait treatment in each infested locality is supplemented by a grid of non-retaining male lure traps.

Throughout this season very few infested fruits were found in treated areas. Indeed, at Griffith in the M.I.A. not more than three infested peaches were recorded in February. By contrast, at Hay and Coolamon there were infested fruit late in the season. Neither of these towns had undertaken any community action for fruit fly control and adult Queensland fruit flies were numerous.

Prior to adoption of the Fruit Fly Suppression Scheme in Narrandera and Hillston, adult Queensland fruit flies were caught fairly regularly and it was not difficult to locate infested fruit there in summer. Since the Scheme, the effect is that only three fruit flies have been found in Narrandera from July, 1962, to June, 1963. In Hillston a total of ten has been taken in those 12 months, compared with 230 in the preceding year. Infested fruit was not found in either town. Isolated adult flies continue to be found in other Scheme localities, including Leeton, Yanco and Griffith.

There is no organised community action in 1962-63 in Hay against fruit fly. Infested fruit was readily found in Hay and Coolamon. A total of 1,229 flies were trapped in Hay between January and May, 1963.

Investigations of ethylene dibromide fumigation as a commodity treatment of oranges against Queensland fruit fly carried out co-operatively with other bodies, have ended. New Zealand has approved the method in principle. Some further trial shipments to New Zealand of oranges fumigated after packing are to be arranged.

EDB fumigation experiments with lemons, mandarins and grapefruit have been commenced. In the previous year preliminary studies of artificial infestation and of fruit uptake of EDB had indicated no special problems with these fruits.

Studies of skin injury to early grapefruit by EDB fumigation were carried out in May-June, 1963. The fruit proved generally quite sensitive to EDB skin injury. This work will be repeated to see whether the fruit is as sensitive when it is more mature. Similar studies were carried out with lemons in June, 1963, and so far it appears that lemons are not especially sensitive to EDB skin injury. There will be similar studies with Emperor mandarins.

For pears, a co-operative project of cold storage (32°F.) sterilisation after artificial infestation was done at the Citrus Wastage Research Laboratory from January to May, 1962. The results, to be statistically examined and plotted on a probit line basis, are not yet available. It is likely that the work will be repeated. The work is planned to conform to U.S. standards for fruit fly commodity treatment work. This requires the experimental populations to be carried through to the pupal stage. With pears this presents some practical difficulties.

A dipping trial with apples, to examine the dosage/mortality response of Queensland fruit fly to dimethoate emulsion, was carried out in 1962. Apples were dipped in dimethoate at 0.04 per cent, 0.02 per cent, 0.01 per cent, 0.005 per cent or 0.0025 per cent, and samples of the fruit were artificially infested with fruit fly eggs at intervals up to three weeks afterwards. Several weeks later the fruit was examined for larvae. Under these laboratory conditions no survival of larvae occurred at 0.04 per cent or 0.03 per cent Rogor; 0.02 per cent Rogor allowed less than 1 per cent survival, and even the 0.0025 per cent Rogor treatment allowed only about half the survival that occurred in untreated fruits.

In a survey of insects found breeding in boxthorn berries (*Lycium lorridum*), collections of ripe fruits were received from Armidale, Tamworth, Dubbo, Wellington, Wentworth, Richmond, Parkes, Bathurst, Yanco and Griffith. Queensland fruit flies were bred in numbers from the Tamworth and Parkes specimens. Other insects bred in numbers were *Musca domestica* (Tamworth), *Scotopse sp.* (Tamworth), *Drosophila melanogaster* (Parkes and Bathurst), *Lamprolonchaea brouniana* (Armidale, Tamworth), *Desmometopa sp.* (Tamworth), *Carpophilus sp.* (Tamworth, Griffith).

VEGETABLE PESTS

Potato Aphids (*Macrosiphum euphorbiae* and *Myzus persicae*).—Difficulties are reported in producing virus-free seed crops of potatoes on the central tablelands. Infection may be occurring late in the season due to influx of infective alate forms of the aphids *Macrosiphum euphorbiae* and *Myzus persicae*.

In a preliminary experiment for control the following materials were applied on 23rd February near Orange: demeton-s-methyl, 4 oz. a.i. per acre; mevinphos, 6 oz. a.i. per acre; menazon (liquid formulation) 2.6 oz. a.i. per acre; dimethoate 4.8 oz. a.i. per acre; and thiometon 4 oz. a.i. per acre.

Dimethoate and liquid menazon plots showed less infestation than other treatments at the 12-day count, but after 20 days the aphid population had risen considerably though still less than on other treatments.

Each treatment was applied again, 26 days after the first, when all plots had been appreciably reinfested. This time vamidothion at 8 oz. a.i. per acre was substituted for thiometon which had looked least effective 20 days after the first application.

Each treatment showed very good control seven days after the second application. No aphids were on plants sprayed with vamidothion or menazon, as compared with an average of six aphids per leaf in untreated plots.

Misting Machines and Tomato Pests.—More work was done on use of misting machines against tomato pests. Combined sprays of DDT emulsion plus dimethoate emulsion plus copper oxchloride plus Shirilan AG were satisfactory at misting concentrations.

Mushroom Pests.—Mushroom flies were a problem late in autumn. The opportunity was taken at Helensburg to determine the merit of dichlorvos as a vapour at the rate of 60 mgms DDVP/100 cubic feet in enclosed sheds. It rapidly killed the flies. As a check, six cages of *Lucilia cuprina* were placed in the 8,000 cubic feet capacity sheds. The blowflies were knocked down in a few minutes when 6 oz. of 100 per cent DDVP concentrate was introduced into the closed circulation system.

Mushroom flies were also controlled when DDVP at the above rate was misted into a tunnel 1,350 feet long, containing three rows of mushrooms in boxes in tiers some 6 feet high. However, observations on blowflies in cages showed that dichlorvos has little residual action. In one test it was effective for 24 hours.

SYSTEMATIC STUDIES

Distribution and Taxonomy of Aphids.—An aphid trapping programme was continued from previous seasons, using three yellow plastic dishes at Rydalmere and making weekly aphid counts.

The six most numerous species are listed and compared with the two previous years' figures:—

Species	Numbers		
	1962-63	1961-62	1960-61
<i>Lipaphis pseudobrassicae</i>	2,303	114	386
<i>Myzus persicae</i>	796	199	209
<i>Macrosiphum euphorbiae</i>	723	314	194
<i>Aphis craccivora</i>	358	Not in first six	
<i>Capitophorus elaeagni</i>	302	Not in first six	
<i>Rhopalosiphum maidis</i>	269	139	144

Trapping peaks occurred September to November, 1962. The single highest month was October. Aphid flight activity was unusually pronounced in this period with, of course, *L. pseudobrassicae* extremely numerous. A much smaller peak was registered in January, 1963, but the high numbers usual for March-April were not in evidence. The very wet weather experienced in Sydney at that time was thought to be the reason.

Study of the Curculionidae.—Specimens added to the weevils collection totalled 1,607 newly-mounted. They comprised the following sub-families: Brachyderinae 302, Otiorynchinae 37, Eremninae 62, Leptopinae 194, Cyliodorrhinae 54, Rhytirrhinae 5, Diabothrariinae 3, Amycterinae 64, Gonipterinae 47, Cleoninae 51, Hylobiinae 10, Eriirrhinae 324, Aterpinae 28, Amalactinae 1, Belinae 23, Apioninae 111, Atelabinae 7, Laemosaccinae 28, Haplonychinae 37, Cryptorhynchinae 49, Rhynchophorinae 44, Cossoninae 80, Unclassified 54. There are now 10,651 specimens in the collection.

The Insect Collection.—This year 5,965 insects were incorporated into the collection. A further 2,063 specimens, affected by verdigris or poorly mounted, were remounted. A total of 74 specimens of spirit material and four dry specimens (parts of plants damaged by insects) were added to the appropriate parts of the collection.

New Pests.—A Muscid fly determined by D. K. McAlpine of the Australian Museum as *Atherigona* sp. was bred from the stem of millet at Rydalmere.

Coleophora alcyonipennella and *Hyperodes bonariensis*, each of which has been intercepted in quarantine for several years, have now become established in N.S.W.

Brevipalpus lewisi, a serious mite pest of grapevines in other parts of the world has been recorded attacking grapes in the Griffith district.

Specimens of a yellow citrus rust mite which has superseded the brown citrus rust mite in coastal citrus orchards over the last ten years have been identified at the British Museum as *Phyllocoptruta oleivora*. The brown form was previously known by this name. True identity of the brown citrus rust mite awaits specialist determination.

A thrip, *Chaetanopothrips orchidii*, has recently done considerable damage to citrus fruits in the Gosford-Wyong district. Some specialists consider it synonymous with *Scerotothrips signipennis* the banana rust thrips. The latter is normally considered restricted to the far north coast.

CHEMISTRY BRANCH

CEREAL SECTION

The Wheat Crop, 1962-63 (26 pool).—The N.S.W. wheat harvest was a record for the State; 98.5 million bushels into the State's silo system by the end of June, 1963; 92.2 million in bulk and 6.3 million bagged. Another three million bushels were delivered to the Victorian railway system.

Analyses of the official F.A.Q. samples were undertaken for the Australian Wheat Board by the Chemistry Branch shortly after the F.A.Q. standards were set in February, 1963.

An average protein reduction of one per cent as compared with the previous year's crop had only a small effect on the baking capacity of the south-western wheat, whilst increased bushel weight was reflected in improved milling capacity. The south western sample with its low proportion of vitreous grain would make a good blending wheat, with its low moisture content and low dockage taken into account. The northern wheat, more extensible and less tough in its dough qualities, would be better value than was the wheat of the previous season to the baker and flour miller.

Premium Wheats.—The total deliveries of all types of premium wheats again increased for the season, due to further increase in bulk premium receipts in the north west. These amounted to eight million bushels, and there were near-normal bagged deliveries of about 2½ million bushels. The bagged deliveries were less than in the previous season, because mills had reasonable carryovers from the previous higher protein crop and because local mills are buying quantities in bulk.

In addition to the northern premiums, a new scheme was initiated in the irrigation Areas. There, over 600,000 bushels of soft low-protein wheats were segregated in bulk after a quick protein test with the Udi analyser. This scheme was initiated by the N.S.W. Flour Millers in co-operation with the Grain Elevators Board. The testing and selection of wheat was done by staff of the flour mills concerned.

Export Wheat and Flour.—Strenuous demands have been made on the cereal chemists by export wheat certification. The 78 shipments certified comprised 973,000 tons or 38.3 million bushels. Most of the shipments were to mainland China, 22 from Newcastle and 56 from Sydney terminal. Running samples are continuously taken from the loading belts by Export and Import Branch inspectors.

Demand for flour certificates has further declined. Only 10 were issued this year. Five of these were for shipments of less than 1,000 tons. There was one shipment 4.5 thousand tons to North Vietnam a possible new market. As with wheat shipments, additional analyses were included in the specifications set by the purchasing country.

Quality Assessments for Northern Breeding Programme.—Following the 1962 harvest and prior to the 1963 sowing, 200 advanced lines were given complete quality assessment for the breeders. These samples in the main were from the breeding programme centred at Tamworth Agricultural Research Station but included several lines from the University of Sydney programme. Many of the crossbreds have the quality characteristics expected of hard, strong wheats grown in the north west. Two of the lines have been selected for seed increase and full scale field and laboratory testing in the coming season. They will be uniform quality tested after the harvest.

Uniform Quality Testing.—The northern crossbred 6204 was subject to uniform quality testing. The technical sub-committee of the Standing Advisory Committee on wheat met in April, after the crossbred had been examined by flour milling laboratories, the Bread Research Institute, and the Wagga and Rydalmere laboratories of this Department. The cereal chemists concerned all agreed, on type and classification, that crossbred 6204 is similar to Eureka. It was decided that seed increase should proceed during 1963-64.

Standing Advisory Committee on Wheat.—The Cereal Chemist represented the Department at the annual meeting of the Advisory Committee on Wheat. The recommendations made there included: deletion of Gabo from all sowings, and full inclusion of Gamanya, Mengavi and Falcon. The meeting also decided to recommend Falcon in certain western and south western areas but not inner southern areas. This decision was made on marketing grounds, following the advice of the grain marketing authorities, in an attempt to retain homogeneity in the southern wheat sample.

Production and Marketing Committee of N.S.W.—The Cereal Chemist attended the meetings held throughout the year. The committee now has a series of draft recommendations, and final opinions have been obtained from the organisations that could be affected by alterations in the existing methods of wheat production and marketing.

Collaborative Studies on Assessment Methods.—Several collaborative studies on methods and assessment were undertaken. Portions of samples of north-western premium wheats were examined simultaneously at laboratories in Rhodesia and England, and at Rydalmere. The outcome was complete agreement for standard analytical techniques, and that the milling, baking and dough assessments were consistent.

The Cereal Section is represented in the experimental baking committee of the Chemical Institute Cereal Group. This committee examined the new "re-mix" research baking technique of the grain research laboratories in Canada. Australian and Canadian flours were interchanged and both sets were tested at similar times, using the same method. There are indications that good agreement has been reached, although there is some doubt as to the value of the "re-mix" method for local evaluation purposes.

Laboratory Sampling Output, and Procedures.—During the year, 2,600 samples of wheat and flour were received in the section. Of these, 1,030 were subject to experimental milling, as against an average of 630 millings per annum over the previous five years. The increase in milling automatically causes an increase in associated flour tests such as farinograms, oven moistures, experimental baking, flour proteins, etc.

In addition, certain other physical and chemical tests have been introduced as a routine. These included: 3,100 thousand grain weight determination, 770 total ashes and many maltose tests. Samples were also tested for the Grain Elevators Board and the Australian Wheat Board, and two research projects were undertaken, with the help of Wheat Industry funds.

Quality Segregation Investigation.—A grant from the Wheat Industry Research Council has been made for an investigation of the possibility of segregation on basis of quality. A project committee meeting in July broadly planned the work for the year. There are four zones, comprising the delivery areas of the four sub-terminals and broadly corresponding with four regions that have different quality characteristics.

Milling and baking of the zone composites, of individual silo samples from throughout the zone, have shown that segregation has resulted in positive differences in several characteristics as between hard and soft segregates. These differences were in protein content, physical dough instrument results, milling characteristics and baking results.

Segregation has also reduced the variability that is normal between zones and between years, particularly for "hard-by-appearance" composites.

Some 4,000 samples were taken during the 1962-63 harvest with Grain Elevators Board co-operation. These have been segregated such as to show the combined effect of visual examination and varietal segregation. The samples were collected from 45 representative wheat receival sites by silo agents. The agents were helped by having a set of grain standards for comparisons whilst deciding visually the sample's classification. Use of the standard significantly improved the silo agents' visual appraisal.

Soft Wheat Quality Investigation.—The Wheat Industry Research Committee granted funds for this. A chemist was appointed in September for the project and the funds in part have also been expended on some equipment.

Wheat samples have been obtained from the seeding rates—fertilizer trials in southern irrigation areas. In these trials there is a range of varieties with a range of protein levels, providing information on the influence of seeding rate and fertilizer application on soft-wheat quality potentials.

Samples with less than 9.5 per cent protein content will be used also to evaluate the cookie test and the alkaline water retention test for Australian conditions.

Preliminary extensograph studies are determining the reliability of the extensograph to assess biscuit quality of soft-wheat flours. It may be possible to develop a modified extensograph technique, to show between soft flours greater differences caused by agronomic methods and the wheat variety.

PESTICIDES SECTION

Correlation of Physico-chemical Properties and Biological Efficiency of Formulations

Cattle Dip Formulations Varied Effect.—Calf dipping experiments at Glenfield showed that, in comparing different formulations of the DDT super-cooled melt type, adjustment of dip concentrations to give equal DDT deposits will not necessarily yield equal biological performance. The differences in performance of the dips are apparently due to the composition of the surface active agents in the formulations.

Investigation of DDT dip formulations has ended because organic phosphorus formulations have replaced them for cattle tick control.

Dip Formulations Tested on Flour Beetles.—Investigation of surface active agents' effects on biological efficiency of pesticide emulsions and suspensions proceeded. The surface active agents varied in their effects on the insect cuticle and influenced the entry of toxic chemicals. This work is continuing with organic phosphorus insecticides and a variety of surface active agents.

Excess Spray Residues on Fruit

This year the investigation proceeded on the following lines.

Surveys of Residue Levels.—(a) *Mercury*: Ten samples of apples were analysed for mercury in the flesh as well as in the peel. There was slightly more mercury in the flesh than in the peel. The total spray residue varied with the number of spray applications, from a practically negligible amount to about 0.03 part per million. The maximum number of spray applications was five. The minimum period between final spraying and harvesting was four months. (The F.D.A. tolerance for mercury is "nil". In United Kingdom, 0.1 p.p.m. is unofficially regarded as an upper limit for mercury spray residues in apples); (b) *Kelthane*: Seven samples

were analysed. The results ranged from 0.09 to 1.25 p.p.m. (F.D.A. tolerance for kelthane = 5 p.p.m.); (c) *Tedion*: A method of analysis was investigated and developed. Five samples were analysed. The results ranged from 0.02 to 0.28 p.p.m. (F.D.A. tolerance for tedion = 5 p.p.m.); (d) *Morocide*: A method of analysis was investigated and found satisfactory. Ten samples from the 1963 crop have so far been analysed. The results are all low, less than 0.2 p.p.m. (An F.D.A. tolerance for morocide has not been established.)

Samples from C.S.I.R.O. Fruit-washing Machine Trials at Bathurst Experiment Farm.—Fifty samples covered six pesticides, viz., gusathion, trithion, kelthane, tedion, sevin and captan. Four treatment methods were used. These were (a) acid washing followed by alkali washing, (b) dry brushing, (c) wet soap brushing and (d) double alkali washing. How much of the pesticide was removed varied with the pesticide and the treatment. Dry brushing was generally the least effective treatment. The pesticides results ranged from almost complete captan removal to only 15-20 per cent kelthane removal.

Insecticide Residues in Animals

Dieldrin.—Treatment of pasture with dieldrin at 1 lb. per acre is a current Departmental recommendation for control of *Anemmus* weevil in north coast clover pastures, but current U.S.A. health laws require that there shall be no residues of dieldrin in meat and milk. The possibility of meat from animals grazing on treated pastures being contaminated, and hence condemned by the U.S.A. authorities as unsuitable for human consumption, could cost Australian producers a valuable export market.

Therefore, experiments were set up to determine the extent to which dieldrin could contaminate under various grazing conditions. Milk samples were taken during the experiments, and fatty tissue samples were taken from animals slaughtered at the end of the experiments. They were analysed for dieldrin content.

Experiments were conducted also at Glenfield Veterinary Research Station to assess the effects of direct swabbing, jetting, dipping applications of dieldrin to sheep, as normal for control of sheep ectoparasites. Fat samples were taken from slaughtered animals for analysis.

From the grazing experiments it was found that whilst the dieldrin content of milk never rose above 0.8 p.p.m. for any of the animals involved, contamination of body fat could be quite high and up to 15.7 p.p.m. Samples from normal private grazing management, showed maximum figures of 0.2 p.p.m. (milk) and 4.8 p.p.m. (fat).

A striking example of formulation effect on residues was shown in the grazing experiments at Duck Creek. Animals grazing full-time on *dusted* pastures showed a maximum of only 1.7 p.p.m. dieldrin in their fat, whilst animals grazing full-time on *sprayed* pastures showed a maximum of 15.7 p.p.m.

With the milk samples, another interesting fact noted was the speed at which the dieldrin moves in the animal body after ingestion. Milk samples taken within one day of the animals grazing on treated pasture showed some of the highest residue results.

Method of application appeared to be important in the experiments on sheep at Glenfield. Jetting gave the highest dieldrin content of body fat, up to 16.8 p.p.m.

Amount of fleece on the sheep also affected absorption of dieldrin. Dipped woolly sheep showed higher contamination than dipped shorn sheep. As a direct result of these experiments, use of dieldrin for external application to sheep and cattle has been prohibited.

Importance of Method of Application, and of Formulation.—Because of the apparent importance of those factors in influencing residue levels, new experiments seemed desirable. These would be to develop control measures that would greatly reduce dieldrin residues on pastures, to eliminate risk of contaminating grazing animals, but also give good control of the weevil. Therefore, experiments were set up in the Richmond-Tweed region.

Different methods of formulation (emulsion, dust, granules) and of application (knapsack spray, hand broadcast, sod-seeder) were tested for biological efficacy and for residues on pasture.

Misting of Vegetable Crops

The results of experiments on trellised tomatoes completed in the previous season at the Horticultural Research Station, Narara, have been analysed.

Chemical measurement of deposition, retention and distribution of copper oxychloride on the foliage of sprayed and misted plants showed that portable misting machines give excessive deposits of copper if the weekly rate is 4 oz. or more per 2 gallons. The previous recommendation for misting of tomatoes was 10 oz. per 2 gallons.

Copper deposit by a high volume treatment, 8 oz. per 20 gallons used as a standard, was about half that from misting at 4 oz. per 2 gallons and about equal to the 2 oz. per 2 gallon misted treatment. General coverage of the plants by the mist was satisfactory. Control of early blight was never significantly different from that given by the high volume treatment.

In the 1963 season the experiments were confined to misting. Sufficient data had previously been accumulated for the high volume treatment. Attention was mainly given to deposition, retention and distribution characteristics of DDT. Fortnightly applications of copper fungicide were also tested against the recommended weekly misted treatment for effective early blight control. The results have not yet been statistically analysed.

Injurious Oil Misting

Many peach trees in a private orchard had died or been severely injured. The grower had misted a spraying oil onto these trees some months earlier.

Dead and living tissue samples taken from underneath the bark were examined for mineral oil content by the thin-layer chromatographic technique. Although the living tissue contained only the merest trace of oil, less than 0.005 mg. per sq. cm. of surface, the dead tissue contained oil at the rate of 0.1 mg. per sq. cm. The evidence strongly suggested that the injury sustained by the trees was caused primarily by oil penetration of the bark.

Insecticide Residues on Grain

Recent work by Departmental entomologists on control of the grain weevil in stored grain has resulted in a recommendation for spraying grain with the organo-phosphorus insecticide malathion. Stored and exported grain is sprayed by the Grain Elevators Board.

Residue studies have now been made here. Wheat samples from the Newcastle and Sydney terminal silos have been analysed. Some samples carried residues greatly in excess of the calculated applied dosages. Further investigations at Glebe Island gave additional evidence that required malathion dosages were not being reliably applied. Grain was obviously being under-treated or over-treated. The problem will be further examined, because excessive residue on exported grain could have serious repercussions for overseas markets and under-treatment could fail to control the weevil.

Standards for Pesticides

The Chemistry Branch has continued to be represented on the Australian Standards Committee for Pesticides. Specifications for phenothiazine and hormone weed killers have been virtually completed. A standard for common names for pesticides is being considered.

Analyses for Advisory Purposes

A wide range of pesticides was analysed for farmers and for other Branches and Divisions. These analyses were to help solve problems arising from their use in protecting crops and livestock from fungal and insecticidal attack and in the destruction of weeds. Advice to farmers and Departmental officers was given on various aspects of pesticides and their use.

Chemical Identification of Citrus Rootstocks

A number of known citrus rootstocks (trifoliata, rough lemon, citrange, grapefruit, mandarin, orange), from the Horticultural Research Station, Narara, were chemically examined in an effort to develop a quick and reliable method of identification of unknown varieties.

Bark from the roots of each variety was extracted with solvents. The extracts were subjected to various chromatographic techniques (spot, paper, thin-layer). Thin-layer chromatography appeared to offer the most reliable means of identification. Most of the constituents in the extracts can be separated fairly readily and reproducibly by it. Differences or similarities in these chromatograms could become the basis of classification of rootstocks.

The technique will be extended to all known varieties, so that all may be classified. The usefulness of the test will then be critically assessed.

WATERS SECTION

The Water Analyses Service.—Some 671 samples were handled at the Rydalmere laboratory for analysis and report. The total was 30 per cent less than in the preceding year. The quality of many of the long established water sources is now known and accepted. Samples now being received mainly relate to new sources of water or to specific problems associated with their use and effects on crops and stock.

Decentralised Water-testing Services.—Whilst demand for analyses declined at headquarters, the total of waters and soils submitted for salinity testing through the decentralised Regional Services increased to 1,596, compared to 1,500 in 1961-62.

The decentralised service this year benefited by the full time availability of the "Agronomist (Water-testing Scheme)" financed from the Agricultural Extension Grant. He has served in each of the nine Regions for periods of three to six weeks, instructing Regional officers in use of the testing equipment and interpretation of data. Valuable service has been rendered, by presenting the chemical/scientific approach to specific problems and by keeping field personnel abreast of water quality and soil salinity research.

Co-operation with other Government Bodies.—Service to the Water Conservation and Irrigation Commission was maintained at Rydalmere headquarters and the decentralised Regional offices, through water analyses and advisory reports. Liaison with the Soil Conservation Service was also maintained, relative to soil factors as affecting erosion.

Research into Uses for the Transistorized Salinity Meter.—The "Salitest" meter was developed by the Chemistry Branch in co-operation with a commercial organisation in 1960.

Gypsum soil-moisture blocks developed in 1961-62 are now in trial use in other States, and overseas enquiries have been received relative to the meter and its equipment.

The meters are now widely distributed in all States, having been purchased by Government instrumentalities and landholders.

Adaptation of the meter to read temperature variations during steam/air sterilisation of seeds and soils to control pathogenic organisms has been undertaken. This development has been valuable to nurserymen. They were already using the meter and its salinity probe for control of irrigation water and seed bed salinity and control of liquid fertilizer concentrations.

Extension Services.—Extension services activities have been actively pursued by the water testing agronomist and by headquarters personnel, in addresses and lectures at in-service Irrigation Schools, and at Agricultural Shows, field days and other group functions.

REGULATORY AND GENERAL CHEMISTRY

Newly-appointed Poultry Research Chemist.—A chemist was appointed to the Seven Hills Poultry Research Station and given special training at Rydalmere in all aspects of stock food analysis and in the techniques applicable to specific poultry research projects. The appointment will result in valuable contributions to research affecting the poultry industry.

Vitamin A Stability.—Research relating to Vitamin A stability in stockfeeds has been agreed upon. The co-operation of feed millers is being sought, to supply representative samples and relevant information. Initial results are expected in the coming year.

General Stockfeeds Analyses.—The majority of stockfeed samples analysed were taken in accordance with provisions of the Stock Foods and Medicines Act. Meat meals from various centres in some cases failed to comply with the requirements of the Act. In most cases the follow-up samples were of satisfactory quality.

Veterinary Medicines Analyses.—The samples included a product, submitted to the Stock Medicines Board for registration, that contained an excess of the specific therapeutic ingredient. Also, a sample of medicated stock food contained a coccidiostat of a type not previously analysed by the Department. Collaboration with a commercial organisation helped to develop a suitable analytical technique.

Fruit Wraps.—Further samples of apple and pear wrappers were examined. The results again showed greatly improved quality and effectiveness.

Analytical Work for Extension Officers and Other Branches.—Regional extension officers were helped by analyses and advice on specific problems. For example:—Samples of peanut meal concentrate on which feeding trials were being conducted by the Hunter Valley Dairy Co-op. were analysed and subject of reports on nutritional values; advice was given on alternative sources of feed for cattle and pigs; natural deposits to which stock were attracted were identified; means of increasing the efficiency of beeswax recovery were elucidated; and prune samples were tested to assist dried fruits research in the irrigation areas.

PHYSICO-CHEMISTRY AND ISOTOPES SECTION

Analysis for Zinc.—The polarographic method for analysis of zinc in plant material, involving use of ion exchange resins, is now yielding very satisfactory results. Results were at first erratic due to integrated influence of numerous factors. These factors were studied and their effects eliminated.

Phosphate Penetration Problem in Pot Experiments.—A short investigational programme on penetration of dissolved phosphorus into potted soil was undertaken in relation to some potash studies. It had been thought that the potash results might be prejudiced by development of phosphorus deficiency due to the gradual fixation of phosphorus during the pot experiment. Therefore, addition of phosphorus during the growing period was tried. Dissolved phosphorus poured on the surface of potted soil did not penetrate sufficiently deeply to be effectively taken up by the roots of the test plants, but it was shown that when dissolved phosphorus was led through a tube into a layer of sand at the bottom of the pot, it was effectively taken up by the roots.

The effectiveness of removal of phosphorus from solution by the soil is interesting when considered in conjunction with the results of investigations on labile phosphorus. It merits further attention when the latter work has progressed further.

Physico-chemical Investigations on Soil Phosphorus.—A study of more fundamental properties of soil phosphorus governing its supply to plants is needed for a better understanding of routine, soil phosphorus tests. The phosphorus-supply power of a soil is related to three fundamental properties often referred to as "capacity", "intensity" and "rate". Present extractant methods are empirical and do not differentiate between them. The labile figure is more fundamental and directly related to "capacity". It should be more widely applicable than individual extractant figures. Isotopic dilution will give the labile figure; and "intensity" and "rate" are physico-chemical properties to which isotopes are particularly suited as a means of study.

The studies of labile phosphorus, and of subsidiary information simultaneously becoming available from the tests, are proceeding.

Lectures on Isotopes.—A series of six lectures on Isotopes was delivered by the Physical Chemist to students of the School of Agriculture, University of Sydney.

PLANT NUTRITION SECTION

Magnesium Deficiency in Citrus.—This magnesium, citrus deficiency in County Cumberland has been of concern to growers and extension officers for a few years. Failure of recommendations has caused further concern.

For a better understanding of the situation, in the past year a spring and an autumn survey were done in relation to incidence and symptoms of magnesium deficiency in the leaves. The results from the autumn (February) survey have not yet been fully analysed but overall there appears to be excellent correlation between incidence of leaf symptoms and leaf magnesium content.

Strangely, leaves sampled in February did not give analytical results in line with those obtained overseas. In the autumn sampling both spring flush leaves and leaves showing the symptoms were sampled. The spring flush leaf does not appear to be a reliable sample for magnesium status of the tree. On the other hand, the leaves showing the symptoms contain magnesium levels that correspond very closely to the incidence of symptoms.

When the survey analyses have been completed trials will be established in County Cumberland to review rates, application times, and magnesium fertilizer types.

Yass Valley Project.—The Department of Agriculture was invited to co-operate in using a technique developed by a C.S.I.R.O. officer in relation to the Yass Valley Project wherein the aim is to apply all the latest methods of research to properties in the Yass Valley. In relation to pasture improvement there are several properties with known fertilizer histories ranging from low to high rates. The C.S.I.R.O. officer's (Bouma) technique will be used as a guide for future fertilizer practices on these properties. Bouma has been in touch with the Chemistry Branch in relation to his work over the last eighteen months and has published a paper on this technique in *The Australian Journal of Agricultural Research*.

The Plant Nutrition Section of the Chemistry Branch has accepted this opportunity to co-operate in the Yass Valley Project, but also to evaluate this method as a diagnostic technique in relation to pasture species. For these purposes, hundreds of plants have been transported to the Chemistry Branch and are being grown in pots.

Manganese Toxicity in French Beans.—Previous studies have confirmed that manganese toxicity has caused stunting and a dark green colour in beans on red basaltic soil in the Terranora locality, on the far north coast. As a result, trials in co-operation with Division of Plant Industry were established on the Terranora vegetable plots to examine methods of reducing manganese levels in beans.

The trials included rates of calcium carbonate up to 2 ton per acre and equivalent rates of calcium hydroxide. Results with high rates of lime during 1962 were promising in relation to yield of beans and reduction of manganese toxicity.

In 1963 beans were again planted on the old plots, but without any further addition of fertilizers. This was to test the long term effect of lime. The test was washed out by excessive rain in 1963 but the plots have been re-planted.

Soils work on these plots in relation to fractionation of the manganese levels has provided a good deal of additional evidence for interpretation of results.

Effects of the original dressings of lime will be observed over a three year period, in terms of: dry matter yield, manganese status of the plants, and soil fractionation of manganese.

Apple Leaf Samplings re Nutrient Variations.—Apple leaves from near-Sydney areas have been sampled monthly as a continuation of studies initiated three years ago, in relation to variations of nutrients in the leaves.

In previous years the effect of leaf age, moisture, position of the tree, etc., were studied. This year's sampling programme yielded evidence that the previous crop and the pruning methods have a vital bearing on nutrient status of apple leaves.

The need for background information in respect of leaf sampling is increasingly apparent. There are many conflicting views on the use of leaf analyses in relation to fertilizer recommendations. The data so far accumulated emphasises the variables that must be taken into account in the sampling procedure. Errors due to these variables could be greater than some of the differences, due to nutrition, which are being sought in the nutrient levels of leaves.



Pasture Nutrient Studies

For laboratory diagnoses of the nutrient needs of pasture species in the field, hundreds of plants have been transferred from the field to pot-growth in the glasshouses at Rydalmere.

Molybdenum in Maize.—Several years ago it was established that hybrid maize was in some cases being produced on molybdenum deficient soils, and that when seed from these properties was sown on soils low in molybdenum there were deficiency symptoms and attendant heavy mortality of young plants. A comprehensive survey of the molybdenum content in hybrid maize seed from growers was done. Specific recommendations were made to seed growers on molybdenum deficient soil.

Recently there have been further reports of molybdenum deficiency on some of these properties. A re-check is now being made of the molybdenum content in the maize seed of all the growers who had been given the original recommendation.

Grades of Sulphur.—Introduction of new sulphur fertilizers has raised problems of sulphur availability as affected by particle size. In experiments at Walcha on a white clover pasture, over a three year period, the problem has been studied in relation to brimstone and finely powdered gypsum.

Yield and sulphur recovery were highest from gypsum in the first harvest but residual effects from this form of sulphur were low in later samplings. Brimstone sulphur gave better residual effects. Fineness of grinding influenced initial availability of brimstone sulphur.

The possibility of using particle size gradings to obtain a degree of controlled availability in sulphur fertilizer has been considered in relation to graziers' present and possible future demands. In mixtures of elemental sulphur with soluble sulphate fertilizers, e.g., sulphur-fortified superphosphate, a limited amount of delayed release in the elemental sulphur form could be desirable. It would spread the response over a longer period.

The results have been prepared for publication.

Phosphorus: Sulphur Ratios in Fertilizers, for Pasture Establishment and Maintenance.—Recent commercial fertilizer introductions present a choice of P:S ratios for use in pasture establishment and maintenance.

Trials have been conducted co-operatively with Division of Plant Industry at Tia, in the New England area, on a sedimentary soil known to be responsive to both phosphorus and sulphur. The results suggest that clover-phalaris pasture has relative P and S requirements in the establishment phase that differ from the requirements for maintenance.

A factorial trial was sown with six levels of phosphorus with six levels of sulphur; each at rates equivalent to 0, $\frac{1}{2}$, 1, 2, 4 and 8 cwt. per acre of superphosphate, applied only at sowing.

Dry matter yield in the establishment phase (six months of summer and autumn growth) was not increased by levels of sulphur beyond $\frac{1}{2}$ S at any level of P. In contrast: dry matter yield increased with each increase in phosphorus supply up to the highest, 8P level.

The phosphorus yield curve was sigmoid in shape, the steepest section lying between the 1P and 2P levels. Interactions between P and S were significant at 1 per cent level.

The low sulphur requirement was in the case of pasture established on a long-fallowed, well prepared seed-bed. A high sulphur requirement might well occur on a sod-seeded or aerial sown pasture.

In addition to the yield effects, P and S treatments increased the protein contents of both the clover and the phalaris.

Results from later harvests, measuring residual effects, indicated that optimum yields were from those treatments that had P and S proportions similar to superphosphate.

Another trial, on the same soil, studying initial and maintenance requirements, showed that annual maintenance treatments incorporating gypsum as well as superphosphate generally gave higher yields than treatments that supplied only superphosphate. This suggests that for efficient maintenance, pastures on this soil would benefit from a fertilizer which has a P:S ratio smaller than that in superphosphate. In contrast: in the establishment phase a higher P:S ratio in the fertilizer than is found in superphosphate would appear to be most efficient.

The present use of superphosphate both for establishment and maintenance of pastures may be wasteful and inefficient, particularly in regard to sulphur in the establishment stages and to phosphorus in the later life of the pasture. More critical assessment of the requirements at each phase is needed, in light of newer fertilizers such as double or triple concentrated superphosphates and sulphur fortified superphosphates which provide for a range of P:S ratios.

This work has been submitted as a paper for the Grasslands Conference to be held in Melbourne in October, 1963.

Lack of Uniformity in Expressing Fertilizers' Nutrient Constituents.—Attention of the fertilizer companies in the various States is being drawn to their lack of uniformity in describing fertilizers, and the archaic methods of expressing nutrient concentrations.

There are three apparent systems of designating fertilizers by numerals:—

- (a) *The "No. 1", "No. 2", etc., method.*—This has led to a good deal of confusion. For example, under this system there are at least four formulations described as No. 8 by four different fertilizer companies:—

	N Per cent.	P ₂ O ₅ Per cent.	K ₂ O Per cent.	N Per cent.	P Per cent.	K Per cent.
A.C.F. No. 8	4	19	0	4	8.3	0
Lamb's No. 8	6	10.5	7.5	6	4.6	6.2
P.B. No. 8	2.9	13	2.3	2.9	5.7	1.9
A.B.O. No. 8	9	7	15	9	3.0	12.5

- (b) *Description of the fertilizer, relative to its N, P₂O₅ and K₂O content, by such numerals as 5-15-5, or 13-13-20, etc.*—This system is the best of the three currently used, but can mislead the purchasers who lack chemical knowledge. They are unable to get a true concept of nutrient contents expressed as the oxides.

- (c) *The, for example, "5-1-1" system.*—This implies a fertilizer containing 5 parts superphosphate, 1 part ammonium sulphate, 1 part of muriate of potash.

With such a lack of uniformity it is understandable that many buyers have little knowledge of what really distinguishes one fertilizer from another.

The ultimate step to simplify fertilizers terminology and remove anomalies could be conversion to a system which expresses the nutrient content in terms of the element rather than its oxide. There is a world-wide trend in this direction. South Australia changed over to this system in 1958.

The suggestions are: (i) unification of the system of naming compound fertilizers by using where possible the nutrient content as the basis, e.g., 5-6-4; (ii) expression of the content of all nutrients as the element rather than the oxide, e.g., per cent P instead of P₂O₅, and per cent K instead of K₂O.

Boron in Relation to Pastures and Crops.—This year there were many reports of alleged boron deficiency, and of predictions as to its likely occurrence. As a result, many growers were induced to apply borax to their lucerne and pasture stands.

The Chemistry Branch has kept the boron status of the pasture species and crops under observation, and the occurrence of proven deficiencies has been well below expectations. Isolated boron deficiency has been shown in beets and Yarloop subclover.

The boron deficiency question is very important. Only relatively minute quantities are needed to make plants grow successfully, whilst slight excess may act as a soil sterilant.

Addresses and Conferences.—A member of the Plant Nutrition Section is Departmental representative in the organising committee for a National Plant Nutrition Conference to be held in 1964 at Perth.

Also, during this past year, extension addresses were delivered at the Sheep and Wool School, University of New South Wales, the Agricultural Bureau State Congress at Hawkesbury Agricultural College, and the District Agronomists' Conference.

SOILS SECTION

Advisory Work

The number of soil samples analysed for advisory purposes increased slightly. More routine soil samples were phosphorus-tested for District agronomists and some soil tests for potash were also done for them.

Phosphate Investigations

Investigation of Methods of Testing.—Work continued on methods of testing soils for their power to supply phosphate. Preliminary investigations for assessing the "labile" soil phosphate, involving the radioactive isotope of phosphorus P32 in isotopic exchange studies, were co-operative with the Physical Chemistry Section.

The dilute acid-fluoride method (Bray and Kurtz No. 1), which extracts what are considered to be available forms of soil phosphorus, continued to be used extensively on routine samples from farmers.

Potato Fertilizer Trials (Windsor, Richmond).—In co-operation with Division of Plant Industry, four potato nutrition trials were conducted on the fertile alluvial soils between Richmond and Windsor. Various rates of superphosphate, sulphate of ammonia and sulphate of potash were used. An attempt to obtain a measure of quality of the potato was made, using a special hydrometer of American design. The results are being analysed by the Biometrician.

Pasture Trials.—Soil samples from the Uniform Pastures Survey and Establishment Trials conducted by Division of Plant Industry continued to be analysed for soil phosphorus. Analytical data have been accumulated since this series of trials commenced.

In collaboration with the Plant Nutrition Section of the Chemistry Branch, and Division of Plant Industry, soils in three long established trials on a podzolic soil near Walcha on the northern tablelands were sampled. These trials have a wide range of controlled phosphorus histories. Correlations of plant phosphorus with Bray and Kurtz No. 1 soluble soil phosphorus are being made. Rapid fall in level of "available" soil phosphorus after cessation of fertilizer phosphorus applications indicates that this soil tends to "fix" added phosphorus relatively quickly. Other tests on this soil tend to confirm this.

Central Western Wheat Nutrition Studies.—Wheat industry funds have been made available for wheat fertilizer trials in the central west. Actually, trials have been made in this part of the State for the last three years as part of the Department's series of Wheat Uniform Fertilizer Trials, and 35 of the total of 80 trials are in the central west. However, the new trials, scheduled to commence in 1964 and to continue for three to five years, involve laboratory analyses of soil and plant material and associated pot studies in the glass-house.

There will be complementary studies in the Riverina and the north-west by the Department, the University of Sydney and the C.S.I.R.O.

Cattle and Beef Research Project—Grafton.—This project, concerned with summer legumes and establishment of a soil phosphate advisory service with particular reference to these plants, was commenced this year in co-operation with Grafton Experiment Farm. Cattle and Beef Industry funds have been made available for it.

The broad aim is to rectify the deficiency of legumes in pastures dominated by native and naturalized grasses, to maintain or improve soil fertility and increase pasture for animal production.

Phosphorus, as well as nitrogen, is known to be deficient in the soils of the area. The particular interest of the Chemistry Branch is in that part of the project concerned with phosphate nutrition studies of the legumes over a number of varied and contrasting soil types. Amongst them are soils from igneous granites, sedimentary sandstones, and shales.

Shannon Vale Nutrition Station—Sheep Breeding and Pastures Management Projects.—Paddocks on Shannon Vale Station have a long superphosphate history. The accumulated totals of fertilizer applied during the last 20 years varying from nil to 30 cwt. per acre. The Soils Section of the Chemistry Branch is co-operating in two projects at Shannon Vale which involve soil analyses for different fractions of soil phosphorus.

Soil analyses in 1961 for available phosphorus showed that the "fixing" capacity of the Shannon Vale podzolic soil developed on granite is less than that of the basalt-derived soils at the Glen Innes Research Station. Recent phosphorus-retention studies have tended to confirm this.

Potash Investigations

Beckman Spectrophotometer Flame Attachment.—This year the equipment was put into proper operation on receipt of a new set of batteries to replace the power supply and also a new phototube house and tubes. It has enabled a great number of analyses to be done, with greater speed, accuracy and reliability.

Using the flame attachment, many of the analyses have been made to determine as between various extractants and procedures the differences in their abilities to remove potassium from the soil. This has enabled the main procedures in the potash project to be carefully evaluated.

Millet Studies, in Pots.—Following the determinations referred to in the preceding paragraph it has been possible to proceed with the main project involving 700 pots of millet grown under glasshouse conditions.

A seedling maggot destroyed many plants and necessitated a replanting. The insect has been identified and control measures applied. The project will recommence shortly.

Nutrient Supplying Power of Citrus Soils

Evaluation of Methods of Testing.—It has been necessary to find suitable methods of measuring exchangeable cations and exchange capacity on sandy, acid soils. A number of methods have been evaluated and, for the sandy acid coastal soils, leaching with 0.1N BaCl₂ is now considered the most suitable.

Citrus Pot Experiment at Narara.—A start was made on exchangeable base determinations on the acid sandy soils from this experiment. About one-third of the samples have been analysed.

Manganese Toxicity Trial with French Beans.—This work has been reported under "Plant Nutrition Section" of the Chemistry Branch.

Salinity Investigations

A Special Appointment for this Work.—An officer has now been appointed for soil salinity work. Specifically the task is to establish salt-critical levels in irrigated soils, for the several horticultural crops. Also, adequate field-sampling methods have to be determined, and rapid analytical techniques have to be reviewed.

Determination of reliable salt-critical levels in soils has been long needed. Many requests are received each year, from landholders and Departmental field officers, for laboratory determinations of salt and for advice.

The available literature on soil stability has now been surveyed with special reference to seasonal variations and the correlations of soil salt levels with productivity decline. The analytical methods for salt have been examined, and modifications suggested for the electrometric titration method for chloride estimation and of sodium and potassium estimation procedures on the Eel flame photometer.

Samples from the Tile Drain Depth and Spacing Experiment.—This experiment is at Griffith Horticultural Research Station. To date 165 samples have been analysed by the saturation extract method for pH, conductivity, OH⁻, CO₃⁼, HCO₃⁼, Cl⁻, B, SO₄⁼, Mg⁺⁺, Na⁺, K⁺ and Ca⁺⁺. Another 450 samples are under attention.

Soil Surveying

Rylstone Soil Survey.—This year a soil survey of the area around the township of Rylstone has been undertaken, with follow-up chemical analyses. The survey was requested by the Mudgee District agronomist because of continual failures of pasture. The failures were thought to be possibly due to high alkalinity level.

The survey has established the following facts.

The soils bear a direct relationship to the topography and, in turn, the geology. In consequence there are two distinct parts within the area surveyed. One is rolling, undulating plain. The other is hilly to mountainous. There are two obvious agricultural divisions. The undulating plain is the more notable for failures.

Chemical analyses established that the soils are not highly alkaline. Their exchange capacities were on average low. Considerable phosphorus deficiency showed up.

A paradoxical feature of the area, with its low alkaline content in the soil, is the frequency of scalded patches along creeks. In dry weather these patches have an encrustation of highly alkaline salts. Analyses of some of the upper coal measure strata through which the water of the creeks percolates offer the explanation. The scalded patches occur only along creeks where there has been passage of water through the underlying strata.

The differences in clover responses in small areas within the undulating plain may be attributed to the varying strata through which the creek water runs.

Another factor directly affecting growth and establishment in the area is climate. The "good years" are those with a high rainfall, and vice versa.

The general conclusion from the survey is that pasture failures in the Rylstone area are due to a series of marginal factors: e.g., climate, phosphorus, exchange capacity, site. Failure occurs if one of these is less satisfactory than is required.

Soil Surveys for Potential Tobacco Land.—An area of a few hundred acres for a proposed Tobacco Research Station in the Wallangra district was soil surveyed.

In addition, an area at Barham was part surveyed and will be completed in the ensuing year.

Balranald Soil Survey.—Further samples were analysed. A report has been prepared for publication.

DAIRY CHEMISTRY SECTION

Butter Salt.—Five brands of salt were examined for flavouring characteristics and chemical composition, and the work indicated that salts which impart the harsher salty taste contain more calcium than the others.

Variation of Moisture Content within a Churn of Butter.—Six butter samples from widely separated points in a churn of butter showed considerable variation in moisture. Their average did not agree with the figure obtained by the factory taking a single large sample. Several churns have been examined, and differences between the average of six samples and the large single sample range from 0.1 to 0.5 per cent. The difference as between different sampling points in the churn was as high as 1 per cent.

The results of 50 churns are being determined. Biometrical analysis will be applied to establish the minimum number of samples needed for an accuracy, for the moisture value, of 0.1 per cent. for the whole churn.

Butter Serum Dispersion.—A review of the factors which affect dispersion of the aqueous phase on butter is near completion. It will be published.

Examination of the effect of dispersion on saltiness showed that for a butter containing a fixed proportion of salt the saltiness was reduced as the dispersion increased.

Butter Survey.—Salt, moisture and pH determinations were made on samples supplied by the State Grader of the Division of Dairying. It was part of the 1962-63 State Butter Survey.

Two hundred and twenty-eight samples were analysed. The average moisture content was 15.35 per cent.; 57 per cent. of samples were below 15.3 per cent. moisture and 5.7 per cent. above 16.0 per cent. moisture. The average salt content was 1.47 per cent.; 22 per cent. of samples were below 1.3 per cent. salt and 1.3 per cent. above 2.0 per cent. salt. Ninety samples drawn from country districts also were analysed.

Dairy Science Schools.—Lectures in dairy chemistry were given to dairy factory apprentices on behalf of the Department of Technical Education. The Dairy Chemist attended the School at Newcastle Technical College in August, 1962, and that at Hawkesbury Agricultural College in May, 1963.

YANCO RESEARCH LABORATORY

Rice Chemistry

Analyses Statistics.—Some 1,500 samples were analysed. These included 777 plants, 141 grain, 187 dry soil and 400 wet soil samples. About 600 exchangeable ammonium, 1,300 total nitrogen and several hundred phosphorus, potassium and moisture determinations were made.

Pre-sowing Analyses for Fertilizer Recommendations.—District rice soils were analysed prior to sowings and fertilizer suggestions were made. Follow-up samplings and analyses were done at three stages of growth in selected crops. Yield figures so far received show that in most cases the fertilizer rates were correct.

Rice Rotation Trial.—Dry soil and wet soil samplings and analyses were done as part of the study of rice nutrition.

Sand Culture, Nitrogen Topdressing Trial.—Useful information was obtained on soil nitrogen effect. Topdressing increased the yield in all cases. Early applications were less effective than basal dressings. Luxury supply of nitrogen in the early stages resulted in its complete use during the first 10 to 12 weeks of growth. Nitrogen given at this point was more effective than basal application.

Grain Protein Determinations.—Grain protein was determined on district samples. The results showed a narrow range, similar to that of previous district survey. Quality tests indicated improvement in quality during the first few months of storage.

Fruit Chemistry

Analyses Statistics.—Some 4,000 analyses were completed in the fruit chemistry section. Most related to samples from citrus and peach orchards subject of Horticulture Division's research projects. Some of the samples were from problem orchards. These yielded a fund of information that will be of value to research, as well as having explained poor crop growth to the grower.

Peach Nutrition Studies.—In the two years since the work on peach nutrition commenced, soil samples have been collected from each of 23 peach orchard sampling sites in the M.I.A. For the two fruit seasons leaf samples have been collected monthly, and fruit samples have been collected at crop maturity.

The soil samples have been analysed for pH, conductivity, N, P, K, Ca, Mg, Na, Cl, Cu and Mn. The leaf samples have been analysed for N, P, K, Ca, Mg, Na, Cl, B, Fe, Mn, Cu and Zn. The fruit samples have been tested for pH, sugar, and titratable acidities.

The soil analyses have indicated that soil acidity is not a problem at any one of the 23 sampling sites; though soils at a few sites are slightly acid on the surface.

At some sites there is evidence of slight salinity problems. Soil samples have been analysed for gypsum deficits. On these sites, where top-soil sodium levels are appreciable, gypsum requirements of the order of 2 and 4 ton per acre are required to displace sodium from soil colloids. A sequel to the presence of undesirable levels of sodium is that soil manganese availability is reduced.

A promising new method for the detection of soil manganese availability is currently in use.

Citrus Leaf Sampling.—At monthly intervals leaf samples have been taken from local citrus orchards, and analysed for nitrogen, phosphorus and potassium contents. The results have been sent to headquarters at Rydalmere for attention by the Plant Nutrition Chemist.

Problem Orchards.—Several problem orchards were visited. At some there was evidence of relatively high sodium concentrations, adversely affecting soil structure and crop growth.

In response to a request for help at Griffith Viticultural Research Station, analyses were made for gypsum requirements of problem areas in a vine variety trial. Subsequent applications of gypsum at rates based on the analyses almost immediately benefited the soil structure and crop growth.

Ethylene Dibromide Tests.—For local horticultural extension officers the Fruit Chemist analysed samples of ethylene dibromide from gas fumigation chambers under test at Griffith. All samples were well above the 50 per cent minimum recovery level required at the end of each two hour

fumigation period. Success of the chambers is of great importance to growers in the M.I.A., because fruit can now be exported to countries that prohibit entry of non-fumigated fruit.

Liaison with Farm Certificate Course and Extension Services.—Though not directly involved in lecturing to the students in the Farm Certificate Course at Yanco Station, the Fruit Chemist has helped in the preparation of lecture notes and laboratory demonstrations, and organised a soil excursion to enable students to see adverse effects on tree growth and root development from compaction near the surface and from impermeable subsoil layers.

Illustrated lectures were given to farmers Extension Group meetings, on "Soil and Plant Analyses" and "Fertilizers in Crop Nutrition".

BOTANY BRANCH

ROYAL BOTANIC GARDENS, NATIONAL HERBARIUM, AND ALLIED ACTIVITIES

Areas Affected by Expressway

Restoration of areas in the Royal Botanic Gardens and Domain affected by the construction of the Expressway is proceeding. The more important items of restoration this year were: landscaping of the Macquarie Street area; construction of an iron picket fence along the boundary of the Gardens; completion of the median strip originally part of Fig Tree Avenue, and of the fore-court to the new entrance in Macquarie Street although the Wishing Well is only partly constructed. This Well is being provided by the Society of Crippled Children.

The main entrance in the south-eastern corner of the Gardens near the Art Gallery has not been finished. There is a temporary entrance.

Royal Botanic Gardens

Improvements.—Notwithstanding the unusual rainfall of this year considerable progress was made, including: enlargement and re-shaping of three large shrubberies; elimination of four flower-beds and turfing of the areas; removal of a lawn-side rockery near the main pond and subsequent turfing of this area; re-grading and re-turfing of the bank below the Darnell-Smith Walk; re-grading and re-turfing of several previously uneven lawn areas.

A series of permanent plots displaying turf grasses was constructed in the Garden Palace Grounds and the surrounding lawn was re-graded and re-turfed.

Special attention has been given to the display of native epiphytic ferns and orchids on trees and palms in the palm-grove of the Middle Garden.

The overgrown display of *Clivea* hybrids below the palms was opened up and re-planted in a more attractive fashion. *Liriope* borders in this area were also re-aligned.

New concrete drain-pipes were installed on the southern border of the Middle Garden, and several roads throughout the grounds were re-surfaced under private contract. A further area, previously part of an old tennis court, has been added to the nursery and is being used for growing open-rooted material.

The Glasshouses.—The increasing number of flat and home-unit dwellers has added to the great interest taken in the glasshouse species display. Throughout the year, series of flowering and decorative-leaved species have been on show.

Unfortunately, at one period two glasshouses were broken into. Valuable plants were stolen, including orchids, pitcher-plants and decorative-leaved species. None of the material was recovered.

The glasshouse staff provided and maintained for the period of the Sydney Royal Show, decorations and pot plants for the official rooms and for several departmental exhibits. Decorations were also provided for the meeting of the 12th World Poultry Science Congress in Sydney.

Landscape Gardening Service.—The Landscape Gardener visited four country centres: Tamworth Agricultural Research Station to plan and report on landscaping; Narrabri to assess and report on tree planting, to the Council; Cowra, for advice to the Council on propagation methods and on development of a display centre; and Vale's Point, for advice on planting to the Electricity Commission.

In the County of Cumberland, by invitation 20 inspections were made, and plans were prepared for planting schemes at the following centres: Birrong Girls' High School; Blacktown High School; Bondi ("Scarba" Children's Home); Burwood Council; Chester Hill High School; Cockle Creek (Sulphide Corporation); Dover Heights Girls' High School; Greystones High School; Hawkesbury Agricultural College (Engineering School); Hunter's Hill Council; Liverpool Hospital; Lurnea Public School; Mona Vale (new Hospital); Moore Park (Sydney Boys' High School); Mosman Council; Sefton High School; Seven Hills (Poultry Research Station); St. Mary's High School; Thornleigh (Child Welfare Department); West Fairfield High School; Westfield High School; and Windsor Court House.

Other Advisory and Allied Services.—The Director and the Assistant Superintendent attended a special planning committee inspection of an area to be planted by the Remembrance Driveway Committee adjacent to the Landsdowne Bridge. Suggestions were made regarding selection of suitable species.

The Assistant Superintendent also visited Wagga Teachers Training College, to report on ground staffing and equipment needs.

The Landscape Gardener judged the finalists in the Wolloughby Progress Association's Garden Competition, as well as the "Herald" garden competition for the same area.

Plant Introduction.—Of particular interest among the species introduced from overseas were the following: *Orphium frutescens*, a pink-flowered shrub of the gentian family from South Africa; *Lavatera arborea*, a biennial of the Malva family from Southern Europe; *Pittosporum tobira*, a free-flowering, highly perfumed shrub native to China and Japan which is eminently suitable for seaside conditions; *Amicia zygomeris*, a white-flowered shrub of the pea family from Mexico, and *Brunfelsia undulata*, a tall white-flowered shrub from Jamaica.

The native orchids have not previously been featured at the Gardens, so a number of ground and epiphytic species have been brought in from the bush and cultivated this year. These have included certain rare garden species, among them the "greenhoods", *Pterostylis barbata* and *Pterostylis nana*, and the rare epiphyte *Peristeranthus hillii*.

A wide range of selections of the Coniferae were obtained from nurseries on the central tablelands for trial in the coastal environment.

The Domains

Storage depots and sheds related to construction of the Expressway have been removed from near the Public Library. The area has been restored to recreational purposes.

The Outer Domain was used to assemble personnel for a number of processions and marches. These included the Anzac Day Service, Anniversary Day Procession, Apprenticeship Week Procession, and the Waratah Spring Festival. Some damage was done to grassed areas during the Anzac Day celebrations as heavy vehicles were driven on to ground softened by unusually heavy rain. Arrangements have been made to prevent future, similar damage.

Parking in parts of the Domain was permitted for a week before Christmas, also during a one-day train strike and at the time of the Royal Visit.

Further delay has been experienced in the complete restoration of the area affected by construction of the City Council parking station. Representations have been made to the City Council.

Centennial Park

Considerable press and television publicity was given to Centennial Park, and there was some criticism of maintenance and the use made of the Park. However, most of the published views supported the present policy of maintaining natural as well as the playing and conventional park areas. Consideration is being given to additional staff and equipment to enable all areas to be adequately maintained.

Certain areas were made available for cross country horse-riding contests during the Sydney Royal Show. The roadways were used also for the Veteran Car Club of Australia's car rally and for the 175th Anniversary cycling competition.

An area in Queen's Park was made available for the Archery Society of New South Wales.

Floral displays that were being developed for the Royal Show period were severely damaged by vandals; and a prosecution was successful against a person for depositing rubbish in Queen's Park.

Consideration has been given to the question of unauthorised parking of vehicles on grassed areas and the matter has been taken up with the Police Department.

Government House

A Royal Garden Party was held on the lawns of Government House grounds during the short visit of Her Majesty Elizabeth II and the Duke of Edinburgh. The grounds were specially prepared. Decorations were maintained during the visit of King Phumipon and Queen Sirikit of Thailand.

A swimming pool has been installed in Government House grounds by Department of Public Works.

National Herbarium

Two officers were overseas for the greater part of the year. This curtailed research in the field and the herbarium. However, the usual volume of routine work was fulfilled and some research progress was achieved.

Plant Species New to New South Wales.—The following species were recorded for the first time within the State:—

Chiloglottis cornuta, in the Perisher Valley, Mt. Kosciusko; previously known only from Victoria and Tasmania. It is a fairly large-flowered ground orchid.

Chrozophora tinctoria, "Turnsole", at Darlington Point in the Griffith district; an annual herb of the family Euphorbiaceae. It is native to the Mediterranean region and is used as a source of a blue dye in Europe.

Indigofera viscosa, at Enngonia, 25 miles south of the Queensland border. It is a small viscid shrub known previously only from Queensland.

Oldenlandia galioides, at Gunderbrooka, via Bourke. It is a small annual herb of the family Rubiaceae recorded formerly from coastal Queensland, Northern Territory and Central Australia.

Weed Species.—Last year's annual report mentioned that a weed species common in the western part of the State and known under the name of *Wedelia glauca* had been misidentified. Information has now been received from the U.S.A. National Herbarium that this species is *Helianthus ciliaris* (syn. *H. laciniatus*), a native of Texas and Arizona. *Wedelia glauca* is the name applied correctly to a weed spreading widely in the Maitland district.

It is of interest to record that three species of "Needle Bush", *Hakea sericea*, *Hakea gibbosa*, and the Western Australian *Hakea sauveolens*, though not troublesome in Australia, have become serious weeds in South Africa. They affect thousands of acres there. A South African entomologist is spending some months in Australia studying these species in the field and hoping to find some natural insect enemies which may control the plants.

Poisonous Species.—A native legume *Isotropis atropurpurea*, which is uncommon in New South Wales killed 12 head of valuable cattle in the Scone district. Pods and seeds were identified in quantity in the rumen contents. The poisonous principle is believed to be an alkaloid and is a powerful muscle poison causing the animals to die quickly. The species has been recorded from Manilla, Warialda, Bingara, Denman and Rivertree as well as at Scone.

The South African succulent *Kalanchoe prolifera* caused the deaths of several head of cattle on the north coast in a period when the normal pastures were heavily flooded. This species grows to six feet in height, so the top portions were above floodwaters. Under normal conditions it is unlikely to be eaten by stock.

Extensions of Range.—The following species were found in regions beyond their previously known limits within the State:—

Corybas undulatus at St. Ives, and at Bergalia on the south coast; a southwards extension from the north coast and one previous record in French's Forest.

Eriachne aristidea, near Cumborah between Walgett and Goodooga; an eastwards extension from Central Australia and one specimen at Fort Grey, New South Wales.

Pterostylis decurva, at Oberon; a westward extension from Mount Wilson.

Pterostylis nana, at Wyangala Dam and Yeoval; an eastwards extension from its sole previously-known collection reputedly at Cobar, though this locality is questionable. It is common in Victoria, South Australia and Tasmania.

Xyris complanata, at Howe's Valley; a southern extension from Kempsey, with one previous record at Narrabeen.

Exchange and Loans with Other Institutions.—During the year 2,670 sheets of herbarium specimens were forwarded to 33 overseas and three Australian institutions. The specimens covered the full range of species obtained by the botanical collector, and a number of specially requested groups such as the Santalaceae, Oleaceae, Lorantheae, Gramineae and Eucalyptus.

In exchange, the Herbarium received 2,225 sheets of specimens from 16 overseas and Australian institutions. These included special collections of orchids from Europe, ferns from New Caledonia and northern Queensland, and ferns from Japan. Among these were some new genera.

Specimens were forwarded on loan to a number of institutions where botanists were studying particular groups. These included: material of *Utricularia* and *Juncus* to Kew, England; *Wrightia* to Missouri; *Arctotis* to Kirstenbosch; *Arthrocnemum* to Johannesburg; *Notoxylon* to Arizona; *Arctotis*, *Cymbonotus* and *Senecio laetus* to Melbourne; *Triglochin* and *Plectranthus* to Brisbane, and *Bassia* to Adelaide.

Mounted specimens of weeds were loaned for display at Tenterfield Agricultural Show.

Field Collections and Seed Exchange.—The Plant Collector spent 61½ days in the field and travelled 4,256 miles. Twenty-two and a half days comprised single or part-day collecting. The remaining 39 days comprised eight collection trips of two to six days' duration in the country as follows: Mudgee-Wollar area; Abercrombie Caves; Oberon-Mount Werong; far South Coast; Grenfell and Orange; Howe's Valley-Wollombi and the Bathurst-Mudgee area.

In all, 250 numbers of herbarium specimens were collected for study and exchange, and 201 seed collections were made for exchange purposes.

Much of the Plant Collector's time in the field was taken up by the search for specific material needed for studies in connection with compilation of data for the new *Flora of New South Wales*. Consequently his collection total was less than in previous years but the additional data from his collections has proved very valuable.

During the general collecting trips specific floral and vegetative material was gathered for despatch by air to overseas botanists studying particular groups. These included: plants of a filmy fern *Polyphlebium venosum*, for the Royal Botanic Gardens, Kew, England; preserved floral parts of *Xanthorrhoea* and *Lomandra* for Hyderabad, India; floral structures of *Blandfordia* for Berkeley, California; young inflorescences of *Philydrium* for Berlin-Dahlem; and living plants of the "Nardoo", *Marsilea*, for Ajmer, India. Selections of wildflowers were collected for exhibition at Alice Springs, Northern Territory and at Broken Hill.

In response to requests, 369 samples of seed were received from 55 overseas and 10 Australian sources; and, in exchange, 1,477 packets of seeds were forwarded from the Herbarium to 162 overseas institutions. The greater number of seeds despatched on request was a sequel to the issuing of the Herbarium's Second *Index Seminum* in the previous year.

Field Investigations.—The field collector has collaborated with the botanical staff in obtaining fresh material required for current research studies. In particular, fruiting material of members of Xyridaceae, very deficient in Herbarium collections, and material required to finalise work on the Restionaceae, were obtained.

Botanists, during leave periods, collected specimens of *Xanthorrhoea*, and species in the *Acacia decurrens* and *A. falciformis* groups for current Herbarium investigations; also several specimens of grasses and other plants from north-western N.S.W. which provided interesting extensions of their known range.

Officers of the C.S.I.R.O. in Hobart collaborated by obtaining and forwarding fresh material of *Xanthorrhoea* from the Type locality near Hobart. The material was required for studies of this genus.

Special Identifications.—Apart from the many plants submitted for identification and report, certain special identifications were made by the botanical staff.

These included: detailed investigations of algae and aquatic angiosperms said to be blocking the cooling systems of the Electricity Commission's power station at Lake Illawarra; algal-like growth in cooling tanks at the Boral Refineries, Botany; plant remains in clothing connected with the Bogle-Chandler deaths; plant parts, seeds and living plants of the drug-plant "Marihuana", *Cannabis sativa*, grown illegally in an inner-city suburb; and seeds in bead-chains, including the recognised poison species "Jequirity", *Abrus precatorius*, a climbing legume of the tropics.

In the case of *Cannabis sativa*, also known as "Indian Hemp", seedlings were cultivated at the Royal Botanic Gardens for the Police Department. Herbarium specimens were collected from these and prepared as permanent exhibits for customs Department, Police Department, Health Department and the University of Sydney School of Pharmacology.

Botanical Research.—Contributions from the New South Wales National Herbarium, Vol. 3, No. 3, containing five papers, was published during the year.

Because of frequent requests by scientific workers for each of the three papers that appeared in *Contribution from the New South Wales National Herbarium*, Vol. 2, No. 1 (1953), now out of print, some multilith "reprints" of each paper have been made.

In addition, *Contributions from the New South Wales National Herbarium*, Vol. 3, No. 4, has passed all proof stages. Publication is expected to occur shortly. This No. 4 will contain eleven papers, as follows: "Calendar of Flowering Times of Some Plants of the Sydney District, Possibly Associated with Pollinosis", by Doreen Price; "*Dryopoa* a New Grass Genus Allied to *Poa*", by Joyce W. Vickery; "*Restio tenuiculmis*, a New Species from Eastern Australia", by S. T. Blake; "A Revision of the *Restio gracilis* Complex", by L. A. S. Johnson and O. D. Evans; "Geographic Races in *Restio tetraphyllus* Labill.", by L. A. S. Johnson and O. D. Evans; "Intragenetic Groups and New Species in *Lepyrodia*", by L. A. S. Johnson and O. D. Evans; "Chromosome Numbers in *Lepyrodia* and *Restio* in Australia", by Barbara G. Briggs; "The Bleaser Botanical Collection from Northern Australia", by H. S. McKee; "New Species of *Juncus* in Australia and New Zealand", by L. A. S. Johnson; "Studies in Australian Pteridophytes, No. 4", by Mary D. Tindale.

The following parts of the *Contributions from the New South Wales National Herbarium*, Flora Series, are also in proof stages:—"No. 201, Hymenophyllaceae", by Mary D. Tindale; "No. 136, Flacourtiaceae", by H. Sleumer.

A paper entitled "Evolution in the Proteaceae", by L. A. S. Johnson and Barbara G. Briggs, has been accepted for publication in the *Australian Journal of Science*.

Typescript has been prepared on the family Restionaceae for the *Flora of New South Wales*.

Work for the *Flora of New South Wales* is well in hand on the families Xanthorrhoeaceae, Centrolepidaceae, Xyridaceae and Eriocaulaceae.

The text of a monograph on *Lastreopsis*, a genus of ferns is almost completed, and illustrations are being prepared. During the year the monograph was extended to include a number of African species found to fall within the limits of the genus.

Some notes on typification and descriptions of new taxa in *Xanthorrhoea* have been prepared for publication prior to the treatment of the family Xanthorrhoeaceae for the *Flora of New South Wales*.

Research is in progress towards production of a Key to the Species of Rhodophyceae (Algae) so far recorded in Australia.

Work continued on a number of other projects previously reported, but wherein progress has been slowed down by two of the botanists being overseas and their routine duties being shared amongst other officers. In the long term, the delay will be more than compensated for in due course by the work the two officers are doing overseas.

Overseas Investigations.—Mr. L. A. S. Johnson was elected Australian Liaison Officer at the Herbarium, Royal Botanic Gardens, Kew, and left for overseas in September, 1962. He travelled via America to enable visits to a number of Herbaria. At Kew he is advancing his studies of the genus *Juncus*.

Dr. B. Briggs was awarded a scholarship by the C.S.I.R.O. and departed in July, 1962, for study at the University of California, Berkeley, California, U.S.A.

Visitors to the Herbarium.—Overseas visitors who worked at the Herbarium and inspected the Royal Botanic Gardens during the year included: Dr. Carlquist, Santa Ana Botanic Garden, California, who studied the woody compositae; Mrs. L. Dempster, Jepson Herbarium, California, who studied *Galium*; Mr. Soetomo Soerobaldoko, Botanic Research Institute, Bogor, Indonesia; Mr. D. Webb, of South Africa; Professor H. Gausson, Toulouse University, specialising in the Gymnosperms; Mr. Patrick Woods, Royal Botanic Gardens, Edinburgh, studying the Gesneriaceae; Mr. T. C. Whitmore, Forest Botanist, British Solomon Islands Protectorate; Miss D. Smith, Botanic Gardens, Christchurch; Professor F. Went, Director, Missouri Botanic Gardens; and Dr. A. C. Smith, of the Smithsonian Institution, Washington.

Australian workers who visited included Dr. N. Burbidge, Mr. M. Gray and Dr. H. S. McKee, of the C.S.I.R.O., Canberra; Dr. M. Phillips and Mr. Burgess, of the Parks and Gardens Branch, Canberra; Miss J. Somerville, Herbarium Curator, Hobart; Mr. N. Hall and Mrs. Marryot, Forestry School, Canberra; Mr. S. L. Everist and Dr. S. Blake, of the Brisbane Herbarium; Dr. H. Aberdeen, Dr. Clifford and Miss G. Evans, of the University of Queensland; Mr. G. Chippendale, Alice Springs; Mr. Smith, Melbourne Herbarium; and Mr. Wilson and Mr. Ising, Adelaide.

General.—A conference of A.N.Z.A.A.S. was held in Sydney during August, 1962. Members of the botanical staff attended selected sessions and meetings of the Systematic Botany Committee. One led a full-day excursion to the sandstone areas in Kuring-gai Chase and the Stony Range Reserve.

A proposal put forward at the Systematic Botany Committee meeting, for production of an index of Australian plant taxa, has been subject of discussion with the C.S.I.R.O. re means of implementation.

Miss M. Tindale was chosen by the National Science Foundation of U.S.A. as one of the professional plant taxonomists to assess the value of the first issue of the new plant index being produced by the New York Botanical Garden staff.

Twenty-four volumes of old botanical works and a copy of Kirk's Forest Flora of New Zealand were received by the library as a bequest from the estate of the late Mrs. B. Maxwell.

Two hundred and thirty-seven photos of type specimens of ferns were received from the Smithsonian Institute, Washington, U.S.A.

Maps showing the distribution of the genera of the family Lorantheaceae were compiled for Dr. Johri, Delhi, India.

Arrangements were made, for the first time, for a cadet to be taken into the Herbarium. A female applicant was selected early in 1963 and has now entered into training in first year Science at the University of Sydney.

The Director made a television recording on National Herbarium work, also broadcasts on "The First Farm" and "The Outer Domain", all for the Australian Broadcasting Commission. The Senior Botanist made a direct telecast for the Australian Broadcasting Commission, "Poison Plants in the Garden", and a broadcast for the Remembrance Driveway Committee. The Plant Collector gave talks on "Wildflower Collecting" and "Seed Dispersal" to societies at Glenbrook, Blackheath and Katoomba, and to the Royal Australian Horticultural Society and the Society for Growing Australian Plants.

The Director and members of the staff served in a number of committees including the Horticultural Advisory Committee of the Ryde School of Horticulture, the Muogamarra Trust, the Remembrance Driveway Committee and its special planning subcommittee.

AGRICULTURAL RESEARCH INSTITUTE, WAGGA WAGGA

Wheat Improvement

Adverse weather conditions hampered sowing, particularly of early stage yield trials. New seeding equipment enabled it to be done quickly when the weather became favourable. Greater uniformity was achieved and led to increased efficiency of small scale trials.

Variety Comparisons.—The 1962-63 tests confirmed evidence gained in the two previous seasons that Mengavi was equal in yield and practically identical in type to Gabo, while Gamenya although very similar in type was significantly better yielding than Gabo. The data was sufficient to discard Gabo and Mengavi and retain only Gamenya as a check for very early maturing crossbreds.

Crossbreds' Advanced Yield Trials.—Only seven crossbreds produced by Institute wheat breeders were tested in advanced yield trials during 1962-63. Three of them were retained for further trial and four were rejected as inferior to existing varieties in some aspect. The fewer crossbreds under test represented the gap between old programmes and those initiated at the foundation of the Institute. In addition to the three lines remaining from the previous test, 16 new crossbreds and two introductions will be tested this year; a total of 21 strains of sufficient promise to warrant advanced testing.

Raven Wheat.—A complex backcross derivative of Dirk 48 was registered and released under the name Raven. It has a double resistance to both stem and leaf rust and also resistance to bunt and mildew. Because of its sensitivity to frost Raven cannot be recommended for N.S.W., but it has performed very well in trials in South Australia where it may be expected to replace Dirk 48.

Phasic Development.—Following demonstration of a simple mode of inheritance of a vernalisation response in spring wheats, further studies have revealed a monogenic control of day length response which differentiates between the wheats of Canada and Australia. Genetic and physiologic studies of growth and development in wheat are being intensified. The studies should make possible a much more direct approach to breeding for adaptation to the Australian environment.

Semi-dwarf Wheats.—Two introductions from Mexico and Chile yielded exceptionally well in 1962-63. These short strawed crossbreds possess a valuable resistance to stem rust and a great deal of interest has been displayed by visitors who have inspected the Institute trials.

Further studies with gibberellin and C.C.C. have confirmed earlier work on the differential varietal response to these chemicals. Genetic studies on the nature of this response are in progress.

Breeding for Disease Resistance.—A particularly heavy infection of Heron wheat by loose smut (*Ustilago tritici*), amounting to over 20 per cent in some cases, was observed in the spring of 1962. It pointed to the need to incorporate loose smut resistance in this variety. Considerable progress has been made towards this end.

Breeding for Quality.—Further studies on the genetics of granularity as measured by the particle size index have been undertaken. Preliminary work on the effect of "hardness" on baking quality has proved disappointing and confusing.

Wheat Quality Investigations

Quality Testing Breeders' Material.—In the period between harvest and sowing the testing fully occupies the Institute's milling and test baking facilities. But the work is having the desired effect on the quality breeding programme, by permitting earlier elimination of undesirable types of wheats and greater concentration of effort on those which show promise as possible new commercial varieties. Early and rapid testing has led to the recognition and progressive elimination of lines with unsatisfactory milling and baking quality. In a relatively short time the stage has been reached where all material in advanced trials now has at least satisfactory quality.

Collaborative milling trials with a number of commercial mills and the investigation of the performance of a recently developed micro test-mill referred to in the previous report have been completed. The micro test-mill proved very successful in all trials and one of these units has now been ordered. This mill, able to handle very small samples of wheat, will enable the rate of milling and baking quality assessment to be still further increased and to be applied at an earlier stage in the breeding programme.

Exploratory work on distribution of flour particle size and its relation to variety and quality characteristics has been resumed with more precise equipment than was formerly available.

An investigation of response in baking quality to variation in protein content of several common varieties is being continued. The accumulating results from routine quality-testing and from supplementary trials with selected wheats are being analysed. Statistical analysis of results from the past season has established very satisfactory limits for significance on the Institute's test-baking results.

The observation that baking quality of some wheats falls off more seriously than others at lower protein levels has been substantiated and taken into account when selecting for quality. Falcon, released in 1960, was outstanding in its ability to retain reasonable quality characteristics at low protein levels. This highly desirable characteristic is being sought in all new crossbreds.

Nitrogen Metabolism.—Using the variety Falcon, a two year experiment to establish the most satisfactory method of raising grain protein was completed in 1962, whilst a procedure, established in 1961, of creating an artificial grain protein range in any given wheat variety has been successfully extended to 15 strains of wheat.

Current experiments include the application of grain-protein raising technique to three varieties of different maturity and at two locations. One of these locations is consistently a low protein area. Another of the experiments is testing the residual effects, on the succeeding wheat crop, of heavy dressings of urea and ammonium sulphate at ear-emergence.

Diastatic Activity.—Over 100 commercially grown wheat varieties were classified on a basis of grain consistency as measured by the particle size index system. A mathematically precise logarithmic relationship was revealed between grain particle size index (P.S.I.) and flour diastatic activity. It was found possible to predict the latter figure to within a few milligrammes of maltose (per 10 grammes of flour) from a knowledge of grain P.S.I.

The series of trials grown in the "Diastatic" series in 10 locations throughout the Australian wheat-belt was concluded. Preliminary reports of some of the agronomic data are being despatched to the collaborators, whilst the chemical and baking tests upon the flour of the 1962 trials are in the process of completion. In view of an interesting observation in relation to the effect of latitude upon grain consistency, a further simpler series of trials has been sown in 1963 at Cressy, Tasmania, Wagga and Biloela via Rockhampton, Queensland.

Oat Improvement

The new variety Cooba again proved outstanding in both forage and grain production. M.1115 (Fulmark x Ballidu x Dale x Fulghum) outyielded all other varieties in the light grazing trials.

Preliminary studies have shown that dense tillering, a retarded ear initiation and a strong rooting system appear to be the most important attributes of superior dual purpose varieties. Varieties like Ballidu, Avon and Fulmark, noted for grain production, may be severely damaged by the uprooting of plants when grazed. This appears to be related to a relatively weak early root development in contrast to the stronger root growth of dual purpose varieties like Cooba and Klein.

Weed Investigations

Skeleton Weed Studies.—Further studies on the effect of environment on seed production and seedling establishment have confirmed and extended previous results. Flowering occurs without vernalization when plants are grown under a 16 hour photoperiod. However, under photoperiods varying from 11 to 14 hours the time taken to come into flower is inversely proportional to the length of exposure to cold.

The germination capacity of laboratory stored seed fell almost to zero after three years. In conjunction with the apparent absence of any real dormancy this suggests that field germination of skeleton weed seed is complete within twelve months of production.

Field trials with several new herbicides indicate the possibility of an increased yield and weed control comparable with that from 2,4-D. Yields following application of Bonvel-D, RD5838 and RD7693 were higher than after 2,4-D. Some triazines were not effective against skeleton weed.

Black Oats Control.—Di-allate applied as a pre-emergence spray at $\frac{1}{2}$ and 1 lb. per acre reduced black oats by 50 per cent and at 2 lb. per acre by 75 per cent. Barbon reduced oat populations at 6 oz. per acre when applied at the $1\frac{1}{2}$ to 2 leaf stage and retarded growth of the remaining plants. Wheat yields were not affected by these treatments, probably because of a generally low oat infestation.

Barley Grass Control.—Chemical control investigations continued. Satisfactory control was obtained with the sodium salt of 2,2-dichloropropionic acid at 2 to 4 lb./acre but subterranean clover production was reduced severely in the year of application. Paraquat at 2 to 4 oz./acre when applied to a grazed pasture in July gave just as effective control without reducing clover yield.

Quaternary Ammonium Compounds on Cereals.—Attempts to use diquat and paraquat for selective weed control in cereals revealed that Australian cereal varieties are readily damaged by these herbicides at rates as low as 1 oz./acre. Both herbicides severely retarded growth and tended to reduce tiller number and height when applied at the 4-leaf stage. Paraquat was most active and at 3 oz. per acre reduced plant numbers severely.

Sprays applied at the 8-leaf stage were more damaging than those applied earlier. Grain yields were reduced by about 10 to 20 per cent by diquat and by up to 60 per cent by paraquat. Oats were somewhat more tolerant of these herbicides than was either wheat or barley.

Crop and Pasture Husbandry

Pasture Utilization.—A trial to examine the effects of top-dressing 0, 1, 2 and 3 cwt. of superphosphate per acre per year with stocking rates of 2, 4 and 6 sheep per acre on subterranean clover wimmera rye grass pasture was initiated in 1962.

Superphosphate increased the amount of available pasture in the first year but there was no difference in animal production per head. Stocking rate of sheep had a dominating influence on both animal and pasture production per acre.

A late break occurred in 1963. Commencing with a live-weight of 95-100 lb. in December, 1962, 6 sheep per acre had dropped to 68 lb. liveweight by May, 1963, 4 sheep per acre had dropped to 87 lb., while 2 sheep per acre were maintained at 100 lb.

The grazing pressure of 6 sheep per acre immediately after the autumn break has greatly reduced the subterranean clover wimmera rye grass population.

The trial is to continue for a further two years when a cropping phase will follow. Soil fertility changes are being measured.

Cropping Intensity Trial.—A long-term rotation trial has been initiated to determine the effect of various cropping intensities on wheat yields, pasture productivity and soil fertility status.

Pasture Oestrogens.—Dry merino ewes, grazing subterranean clover that had germinated in January, produced copious amounts of milk. The degree of lactation was proportional to the quantity of available subterranean clover. The daily intake of oestrogenic substances appeared to be above 20 microgrammes stilboestrol equivalent. This is sufficient to drastically reduce lambing percentages.

A reliable assay technique has been developed for pasture oestrogens. Vaginal cytology changes are related to oestrogen stimulation. Using this technique, lucerne (*var.* Hunter River) has been found inactive during the vegetative, early bud, and 1/10 flower stage, but potent (3 microgrammes per cent) during mid-seed stage.

Moisture Studies of Wheat Crops.—Four main field trials, all designed to study the overall physiology of the wheat crop (*var.* Heron) were sown in 1962. Various crop parameters were followed with varying intensities in these trials. The trials involve sowing time, sowing rate and fertilizer treatments.

The main aspects of crop physiology studied were:—

- (1) Crop developmental patterns, observing the dates of several important developmental stages: plant emergence, ear initiation, jointing, ear emergence, anthesis and dough stage.
- (2) Crop growth: time patterns as indicated by total dry matter, leaf area index and tiller numbers during the vegetative stage. After flowering, measurements of crop growth were intensified, photosynthetic components (leaf, stem and head) being measured separately at weekly intervals together with grain growth. Leaf area measurements were greatly facilitated by use of a leaf area suction planimeter installed early in 1962.
- (3) Soil moisture patterns and crop evapotranspiration: these measurements were made mainly with a neutron moisture meter acquired in May, 1962. Considerable time was involved in testing and calibrating this meter, but when operating satisfactorily its superior efficiency as a method of following soil moisture changes was obvious. As a corollary to soil moisture studies, work was done on the collection of samples and the determination of bulk density and of soil moisture/tension curves using pressure plates and membranes. Satisfactory techniques were evolved enabling the rapid determination of these curves, although sample collection from the field with a thin-walled tube must be fairly intensive for reasonable accuracy.
- (4) Plant internal moisture status studies were also made using the relative turgidity leaf sampling technique.

From these 1962 trials a large amount of data concerning those aspects has been collected. Analysis and interpretation of the data are still proceeding, but the main implications are now obvious:—

- (1) Crop developmental patterns are affected markedly by time of sowing and somewhat by fertility. The delay in date of flowering caused by later sowing has very critical effects on yield, and the small delay as a result of reduced super dressings also has significant effects on yield. Generally the later the flowering, the less the yield.
- (2) Crop vegetative growth was most sensitive to fertility level and, generally, in 1962 with a favourable spring, grain yields were directly related to the amount of vegetative growth. Grain yields appeared to be closely related to photosynthetic area duration after flowering, and the importance of head and stem photosynthesis is obvious. The implication of the former is that variations in grain yield may be due more to variations in the amount of photosynthetic tissue after flowering than to the efficiency per unit area of this tissue.
- (3) Evapotranspiration tended to be independent of crop type during the winter and early spring but, later on, when soil moisture was still adequate and crop type differences were larger, evapotranspiration tended to increase with crop leaf area index and/or height. As soil moisture became limiting, this controlled the evapotranspiration rates and it was interesting to note the low ratio of evapotranspiration to free water evapotranspiration generally after flowering. It indicated that during the grain-producing period even in a favourable spring there is considerable soil moisture stress.
- (4) Soil moisture stress levels were reflected generally in leaf relative turgidities and this technique offers considerable promise for following plant moisture stress.

Soil Fertility

Agronomic Survey.—The Agronomic Survey Unit has completed its first five-year period of operation. A detailed report of major activities within that period has been compiled and presented to the New South Wales Wheat Industry Research Committee which is supporting the Survey Unit.

Now that the results of the 1961 survey have been completely analysed, it is possible to see an association between length of clover ley, topdressing of ley and intensity of cropping on the one hand and grain protein content and bushel weight on the other. The influence of clover leys on grain protein content has been demonstrated previously in other States, but, as far as can be determined, this is the first time that an association between bushel weight and ley management and cropping practice has been established.

Haying off and pinching have been shown to be most prominent in first crops grown after clover leys with a heavy superphosphate topdressing history.

Soil Mineral Nitrogen.—(a) *Field Studies:* The data from a field experiment carried out in 1961 to study the response of wheat as measured by yield and nitrogen uptake and the net changes in soil mineral nitrogen to varying amounts of water applied during the season has been statistically analysed.

Under the experimental conditions, additional water had no effect on dry-matter yield or tiller number until the post-flowering period. Then yield and tiller survival increased on the irrigated treatments. These treatments continued to show yield increases until harvest, whereas the control treatments showed significant dry matter losses in the later stages of development. Additional water applied at the ear-emergence and milk stages resulted in improved grain yields, due to a positive response in grain weight and bushel weight.

Apart from several minor responses in straw and husk nitrogen content, the main response to irrigation was in grain nitrogen. This was particularly so in the late stages of maturing, when additional water favoured continued translocation of nitrogen in the plant.

Additional water applied at the jointing stage, which appeared to be important in determining yield responses by increasing the number of grains set, also showed a positive response in grain nitrogen content and a significant decrease in soil mineral nitrogen.

Apart from a net loss in soil mineral nitrogen as a result of the jointing stage water application, water had no marked effect on the net mineral nitrogen content of the soil.

(b) *Laboratory Investigations:* Drying of soil samples followed by storage prior to extraction increased the level of ammonia-nitrogen and decreased the level of nitrate-nitrogen. Storage of samples for periods up to 18 weeks, at field moisture and after drying at 80° C for 24 hours, increased the level of total mineral nitrogen (ammonia + nitrate-nitrogen). Samples dried at 40° C for 24 hours and then stored showed no significant changes in total mineral nitrogen, although there were changes in the relative concentrations of ammonia and nitrate nitrogen.

Laboratory alterations on the old Cereal Physics Laboratory were completed at the end of last year. The Laboratory was occupied from the start of the current year.

A preliminary pot trial using soil for the proposed experimental area demonstrated that sulphur had no effect on the growth of wheat. A preliminary field trial showed the soil over the experimental area to be uniform. Fertilizer treatments were applied to the plots of the field experiment, and residual effects from these fertilizers will be assessed by the growth of wheat and subterranean clover. The second pot experiment, to investigate the fate of superphosphate applied to the soil of the experimental area, was completed.

DIVISION OF MARKETING AND AGRICULTURAL ECONOMICS

State Marketing Bureau

Marketing Boards.—The Egg, Rice, Navy Bean and Wine Grapes Marketing Boards constituted under the Marketing of Primary Products Act, continued to function. The French Bean Seed Marketing Board is in process of dissolution following a grower poll and the appointment of a liquidator. A Lemon Marketing Board has been constituted. Its first meeting was in June, 1963.

Amendments to Regulations.—Several Regulations under the Marketing of Primary Products Act were amended. For purposes of polls the definition of a "producer" was amended by adding a new subclause defining the producers of lemons. Regulations in respect of the Rice Marketing Board were amended to provide for increased fees and allowances to Board members.

Polls and Elections.—Several polls were held under the Marketing of Primary Products Act, for election of producer representatives and on the question of dissolution of one Board and the constitution of another. The polls were as follows:—

- (a) Triennial Elections of three producers' representatives to the French Bean Seed Marketing Board.

- (b) A poll on the question of dissolution of the French Bean Seed Marketing Board.
- (c) A poll on the question of constitution of a Lemon Marketing Board.
- (d) A poll for election of five producers' representatives to the Lemon Marketing Board.

Marketing Reports and Related Services.—The Division fulfilled its statutory functions under the Marketing of Primary Products Act, continuing to collect and disseminate detailed marketing information on the various wholesale markets.

Markets officers prepared reports on supplies, quality, prices and price movements at the City Municipal Markets (fruit, vegetables, poultry, fish and cut flowers), and the Homebush (cattle, sheep and pigs), Alexandria, Perry's Park and Sussex Street (grain, forage and hard vegetables) Markets.

The collated information was broadcast daily by the Australian Broadcasting Commission, including regional relays and inter-State hookups. Some commercial radio stations also utilized portions of the market information. The daily press, periodicals, Federal and State Government Departments and instrumentalities, producer organizations, etc., were furnished with detailed marketing information per medium of the *Daily Wholesale Price Quotations*.

Retail price collection work was continued. Coverage was further increased, in terms of commodities and localities. This service covers fruit, vegetables, beef, mutton, lamb, pork and fish.

Weekly Marketing Notes.—The Division continued to prepare and distribute the Notes. They are widely circulated and comprise details of sheep, cattle and pig sales at Homebush, prices and supplies of fruit, vegetables, cut flowers, forage, meat, fish, poultry, grain (local and overseas), miscellaneous farm produce, and processed products. The notes also cover cold storage statistics of butter, cheese and fruit, and a series of monthly average prices of a comprehensive range of farm products drawn from the Divisional records.

Monthly surveys collated stock feed prices on a wholesale and retail basis and the wholesale prices of dressed poultry.

Records were maintained showing arrivals into Sydney by rail and sea of various primary products from inter-State and intra-State sources.

Numerous requests for information on prices and prospective markets for an extensive range of primary products were received from State and Federal Government Departments, banks, and private individuals in Australia and overseas.

Crop Reviews and Forecasts.—This service was continued. Forecasts of production were prepared in respect of wheat, oats, citrus and broom millet. The regular monthly survey and broadsheet of *New South Wales Pastoral Conditions* and the *Report on Production Trends* continued.

Meteorological Services.—A Divisional Officer continued as Departmental representative in N.S.W. Climatological Committee and as the Department's liaison officer with the Sydney Weather Bureau. Comprehensive meteorological data were maintained in the Division. Advice and data were provided for officers of various Divisions of the Department and members of the public, particularly on rainfall as affecting various farm pursuits.

Economics Research

Some expansion of the economic research programme followed the continued improvement of the professional staff position. The main research projects completed or in progress were as follows:—

Agricultural Significance of an Area Served by a Deep Sea Port at Iluka.—This study was initiated at the request of Department of Public Works to help further consideration of development of a deep sea port at Iluka on the Clarence River. This proposal was subject of a special committee of inquiry in 1946.

The study aims to estimate totals of major farm products from the port's hinterland that might be available for overseas and interstate shipments now and in the foreseeable future. It has been found that several commodities important in the area, including butter and sugar, would be unlikely exports because home consumption equals or is greater than

production. There are other commodities that would provide only a small proportion of total production for export. Major farm products that would be available for export were beef and veal, mutton and lamb, wool, wheat, oats and bananas.

A detailed report on the study has been compiled for Department of Public Works. An article based on the study also appeared in the Division's quarterly journal *The Review of Marketing and Agricultural Economics*.

Production and Marketing of Honey in N.S.W.—The first results of this detailed study have been published in *The Review of Marketing and Agricultural Economics*. Part of this article was also adapted for publication in *The Australasian Beekeeper*.

The project has provided the first detailed recording of the habits and practices of beekeepers in honey production and marketing. As well, the following points showed up:—

- (a) Australia is the world's third largest honey producer and the most important in terms of yield per hive.
- (b) New South Wales output of honey and beeswax has increased four-fold in the last 25 years.
- (c) Over 80 per cent. of beekeepers are itinerant, operating from headquarters in country towns near to known honey-rich floral areas.

During the field work of this first part of the study over 200 of the State's 600 commercial apiarists were contacted by questionnaire. Some 80 of these beekeepers have also kept financial records in 1962-63, and analyses will indicate factors affecting costs and returns.

Economic Study of the North Coast Dairy Industry.—This work, referred to in earlier reports, has continued. The major current aspect of it is a comprehensive study of problems that face north coast dairyfarmers in adjusting to contemporary marketing and cost difficulties. Linear programming methods are being formulated to describe and explore the situation of representative individual farms.

The results of this study will be valuable to extension workers and farmers generally in planning farm activities. They will also be a guide to governments in making policy decisions.

In addition to that major study of adjustment problems, several subsidiary projects on the economics of the north coast Dairy Industry are in progress.

Economics of the North Coast Dairy Industry "Feed Year" Concept.—A study designed to make possible an economic assessment of the principle of supplying dairy cows with a high quality pasture supplement throughout lactation—the "feed year"—on the red basaltic soils of the far north coast has been commenced in co-operation with other Divisions of the Department. The Reserve Bank has granted £3,000 for expenditure on the project over three years. Initial sowings of improved pastures have been completed. Results of the study will be of value to the 1,000 dairyfarmers on this soil type.

Sprinkler Irrigation Economics on the Far North Coast.—The production possibilities from sprinkler irrigation on north coast dairy farms are being studied. Sprinkler irrigation's role in the farm programme, and alternative means of achieving the same effect on farm production and income will be examined. Reliable information for dairyfarmers intending to irrigate is keenly awaited.

The Farm Water Supplies Branch of W.C. & I.C. will find the results useful when designing irrigation projects. Lending institutions also require data on the economics of sprinkler irrigation development.

Field work was done in October and December, 1962, when irrigated and non-irrigated properties were sampled. Some results, on production increases, have already been published in *The Review of Marketing and Agricultural Economics*. The project may be completed by the end of 1963.

Economic Study of Coleambally Irrigation Settlement.—This study now includes properties taken up in each of the first three years of development. Not every farmer who at first desired to co-operate in the study has been able to continue keeping records, because the early stages of property development have made exacting demands on them. At present, 37 mixed farms and six horticultural farms are participating. Records have been compiled for these properties since their inception, and the first settlers have now completed a third year of occupancy.

The main aims are to study capital accumulation and associated costs of development and to measure the range of incomes. There are subsidiary objectives including a study of relationship between capital resources at commencement and subsequent rate of development and levels of income. Attention will be paid to profitability of alternative farm enterprises, and farm size effect will be studied.

Resultant data will be useful to Government agencies concerned with planning of irrigation areas, and to intending settlers and the lending agencies concerned with financing development of such areas. It should also provide extension information on desirable changes of enterprise as development proceeds and market changes occur.

Economics of Fertilizer Usage.—Some aspects of this study have been delayed because of the overseas study leave departure of the Economics Research Officer concerned. However, the work is continuing and a further experiment has been commenced in co-operation with the Research Agronomist at Taree. This is a whole-farm experiment for a three-year term, on the economics of using nitrogenous fertilizers on pastures and fodder crops. Plans for 1963 implementation of the full first year programme were affected and delayed by the year's floods.

Farm Management Study, Nowra District.—Twenty dairy-farmers have co-operated in this for the past five years. Financial and production records have been analysed annually. The summarised results have been distributed as roneos to the participating farmers, extension workers associated with the industry, university and college lecturers, and other interested persons. The data have also been illustratively useful in farm management lectures.

The Pattern of Industry Financial Assistance to Rural Research.—This project continued and findings are now being documented. It has been subtitled "A Study of Administrative and Economic Aspects of Research Funds Collected by Levies on Primary Produce".

The material is in three sections: (i) "The Framework of Agricultural Research in Australia"; (ii) "The Effect of Industry Funds on Agricultural Research"; (iii) "The Distribution of the Gains of Research".

The first two sections cover development and structure of research and research institutions, administrative structure of industry funds, and fund allocation procedures. The third deals with the economic effects, the impact of research on supply of agricultural products and hence on their price. It attempts to analyse the relationships between these things to ascertain where the benefits from research fall.

Optimum Enterprise Combination for Farms on the North-Western Slopes.—This study is nearing completion. It has aimed to determine the optimum combination of enterprises and methods of production for typical situations on wheat farms in north-western N.S.W. and the changes, in the optima, that would be induced by changes in prices, costs and input/output relationships.

The random sample comprised 60 farms producing wheat. Information on the organization and management of each farm was collected. Analyses supplemented by information from Departmental field experiments in the area have enabled the formulation of average input/output coefficients for various enterprises and methods of production.

An article describing the first phase of the study and giving information on the labour coefficients has been published in *The Review of Marketing and Agricultural Economics*. This phase of the study is in itself of value to farmers, extension officers and research workers because hitherto there has been no published information on N.S.W. wheat farm labour "requirements".

The second phase involves application of parametric linear programming to the data to give optimum programmes for farms of varying size and with different labour forces. The data have been assembled in the necessary form for computation by SILLIAC shortly.

A result should be establishment of general patterns of economic optimum farm programmes on the north-western slopes. These would be valuable guides to individual farmers or their advisors, in planning and budgeting.

Establishing Problems in Farming.—Pressure of other work further delayed this project but it is expected to be completed by the end of 1963.

Scope has been widened to include in the sample a number of farmers who started farming without Lands Department assistance. (The bulk of the farmers studied obtained their properties under the War Service Land Settlement Scheme.) The information from this study will add considerable knowledge about accumulation of farm capital and the general establishment problems in farming.

Economics of Serrated Tussock Control.—The work continued and a preliminary paper on economic principles as they apply to the problem of serrated tussock control has been prepared. It was presented to a school organised mainly for local-government weed inspectors in 1962.

The project is now proceeding as a case study. Comprehensive records have been obtained from a particular farm engaged in eradication of serrated tussock. The further data will be published in a report shortly.

Economics of Cotton Production under Irrigation.—Some work has been done and a preliminary article on economics of cotton growing has been published in *The Agricultural Gazette of N.S.W.*

A number of cotton growers in the south-west have kept records of their 1962-63 cotton programme, and arrangements are in hand to obtain more detailed information on labour and tractor inputs for the 1963-64 season. The resultant information when analysed will be valuable in the economic development of cotton growing in this State.

Poultry Management Study.—Since July, 1962, this Division has been responsible for a Poultry Management Study, in the Sydney area, previously conducted by the Commonwealth Bureau of Agricultural Economics. There were some difficulties in the change-over phase, such that a full year's results will be available from only seven farms, but the project is now moving satisfactorily and its scope is being expanded in 1963-64.

Main aim of the study is, from detailed analyses of records kept by a number of commercial egg producers, a set of standards by which poultry farmers can assess the organization of their farm.

Dairy Investment Study.—This has been initiated to collect background information on the level of investment in and the extent of dairying in the Southern Agricultural Region. Of 6,600 primary producers in the Southern Region about 1,200 are dairyfarmers. The study will provide information of value to policy makers but its main aim is information to help extension services and farm planning.

Collection of the financial data has been undertaken mainly by the dairyfarmers in the Southern Region, using survey sheets prepared in collaboration with them. The data collection phase will be completed by September, 1963.

Optimum Machinery Size.—Preliminary work has been done on a project to collect figures and develop a pattern that may be used to estimate optimum machinery size on wheat farms. The work has been based on a technique developed by the U.S. Department of Agriculture.

Economic Study of the Pome Fruit Industry.—Because of potential difficulties of the apple and pear industry, in marketing, a study has been initiated with special reference to the Batlow, Orange and New England districts. These are the main production areas of N.S.W. Initially, 140 orchardists selected at random will be interviewed. After these data have been analysed, apple and pear marketing prospects will be studied with due regard to likely greater production in future from the continued increase in plantings in recent years.

Spring vs Autumn Lambing Under Irrigation.—Preliminary work has been done on the relative profitability of spring versus autumn lambing under irrigation conditions. A parametric budgeting approach is being used. The major variables may thus be isolated. Actual budgets will be constructed to test the accuracy of the parametric budget.

Barley Marketing and Production in N.S.W.—Barley is a relatively minor crop in N.S.W. but production has increased in recent years and immediate further increases are expected. A study is in hand: to delineate the major production areas; ascertain the producers' marketing methods and the price fluctuations they encounter; ascertain the producers' market needs and the relative roles played by grain merchants, breweries, maltsters, stock feed manufacturers and others in the utilization of barley; and to examine the possibilities for future expansion of the industry in this State.

Bibliography of Agricultural Economics.—A comprehensive *Bibliography of Agricultural Economics in Australia, 1788-1960* is being prepared by this Division's Mr. G. C. McFarlane, Special Economics Research Officer (Farm Management) in collaboration with Dr. J. L. Dillon, University of Adelaide Department of Economics. This work is nearing completion. It will be a major aid to research and extension workers throughout Australia.

Advisory, Educational and Extension Activities

Farm Management Extension Service.—This new service was referred to in last year's report. It has further developed, but only slowly because of difficulties in recruiting staff with experience in farm management research and extension.

An Economics Research Officer has been appointed to another of the Department's Agricultural Regions, the Southern Region, with headquarters at Leeton. Thus there are now three Regional Economics Research Officers—Wagga, Tamworth, Leeton.

In-service training schools in farm management for the Department's technical extension staff and for research workers in various fields have continued.

An important development this year was a programme of farm management schools for members of the farming community. Two of these schools were held and this avenue of group extension will expand. There were also special courses of lectures (weekly for a few weeks) for farmers, in farm management and farm record-keeping. Provision of group extension in farm management will help the farmers to use the latest farm management techniques and apply economic principles.

Policy Advice.—The Division continued to provide advice on economic policy affecting agriculture, and to examine and advise on the position concerning imports and exports of coarse grains, protein concentrates and other farm requisites.

Quarterly Journal.—The Division continued to publish its quarterly journal *The Review of Marketing and Agricultural Economics*. A high standard has been maintained. Papers from agricultural economists employed in other organizations are accepted. In particular, the Faculty of Agricultural Economics, University of New England, has submitted numerous papers.

Lectures at Extension Schools.—In addition to organising and staffing the farm management schools already referred to, the Division's officers addressed numerous schools organised by other parts of the Department, and by the Agricultural Bureau of N.S.W., the universities and other parties. The officers also addressed various professional societies and other organizations on economic aspects of the rural industries.

Lecture Courses at Agricultural Colleges.—The Division continued to provide the farm management lecturer at Wagga Agricultural College and provided also the farm management lecturer for the Farm Certificate Course now established at Yanco Agricultural Research Station. The Division continued to assist the Agricultural Economics Lecturer at Hawkesbury Agricultural College.

Representation in Committees

Divisional officers continued as Departmental representatives in the State Nutrition Committee, the Markets Advisory Committee and the Economics and Land Use Committees of the Hunter Valley Research Foundation. Departmental representation in the State Mapping Committee has been transferred to the Division of Science Services. An officer continued to act as a Ministerial nominee in the Rice Marketing Board. The Division provided the Chairman of the Yass Valley Project Technical Committee.

The Principal Economics Research Officer has this year been President of the N.S.W. Branch of the Australian Agricultural Economics Society and Vice-President of the Federal body.

DIVISION OF INFORMATION SERVICES

Scope

The Division continues to work in the following areas:—

- editing and production of publications;
- sales of advertisement space and some publications;
- information and distribution of publications, in response to 'phoned, postal, and in-person requests by the public; and a special home gardens inquiry service;
- collation and distribution of publications in bulk to country offices;
- library services throughout the Department;
- provision of audio and visual education aids and equipment for extension workers, and promotion of extension workers' interest and skills in using them;
- promotion of group extension activities through the Agricultural Bureau of N.S.W. and kindred rural bodies;
- extension services for rural women and farm homes;
- short-term schools/courses for rural people and Departmental officers: organisation and, in some cases, tutorial staffing of them, and help to other parts of the Department in staging similar schools/courses;
- extension service method training for officers of all Divisions and for Department of Education Junior Farmer Club Supervisors;
- by invitation, extension service/extension method courses for University of Sydney and University of New England students in Agricultural Science, Rural Science, Agricultural Economics, and for Wagga Agricultural College students;
- examination of Diplomate field officers, in "extension service methods", for Higher Salary Grades (P.S.B. Reg. 124 Exam.);
- representation of the Department and/or the Agricultural Bureau of N.S.W. in certain councils, boards, committees.

Staff Numbers

There were 51 positions at 30th June, 1963; two more than at 30th June, 1962. The two additional positions are "Research Liaison Officer (Scientific Publications)" and "Library Assistant (Wagga College and Research Institute branch libraries)". Each of those two positions is vacant at 30th June, 1963, but the Research Liaison Officer will take up duties on 1st July, 1963, and the Library Assistant is expected to take up duties during July, 1963.

The 51 include nine library officer positions, the occupants of which are Department of Education officers seconded from the Public Library of N.S.W. Also in the total is the Home Gardens Inquiry Officer. His salary is budgetted through Plant Industry Division.

Four officers' positions arise from Commonwealth Grants. They are:—a display artist/designer; an editorial assistant; an office assistant for library photocopying and film services; and a technical assistant in radio/photographic work, whose salary is derived from Commonwealth Grant funds (£) and C.R. funds (£).

One junior clerk position, in the Inquiry Counter and Publications Distribution Section, was re-classified this year. It is now designated "Attendant".

Editing Services

Periodicals.—Fifty-two issues of the weekly *Press Copy* (circn. 1,170), 12 issues of the monthly *Agricultural Gazette of N.S.W.* (circn. increased from 36,250 to 36,790), 10 issues of the monthly *Poultry Notes* (circn. 5,810), six issues of the two-monthly *Dairy Topics*, and No. 1 issue of the new series *Research for the Farmer* were processed. The final monthly issue of *Poultry Notes* was April, 1963. Henceforth *Poultry Notes* will be a quarterly, and July, 1963, will be the next issue.

New Series "Research for the Farmer".—The material for No. 1 in this new series comprised articles from the Agricultural Research Institute, Wagga, and the Number was subtitled "In the Southern Region". Departmental institutions in other regions are working on copy for Numbers within the series. The style of presentation has been calculated to increase public awareness of research work in hand and recent results, and in particular to provide liaison reading for leading producers as well as extension workers.

Agricultural Gazette Changes.—The *Agricultural Gazette of N.S.W.* appeared as a 64-page publication in January, 1963, reduced from 96 pages because of the policy for gradual discontinuance of advertising. Letterpress pages increased from 53 to nearer to 64, for the same reason.

Late in the year a decision has been made to reduce the *Agricultural Gazette* issues for July and August, 1963, from 64 pages to 48 pages, as a device to get back on to schedule with the printery.

A "Farm Home" section was re-commenced in the *Gazette* as from December, 1962 issue. The previous attempt, six years ago, was abortive. The re-commenced section is proving popular and has the support of the Women's Extension Service.

Another proposal for the *Gazette* is a pictorial, centred double-page spread as a regular feature. Saddle-stitch binding has replaced the previous side-stitching of the *Gazette* and lends itself to the proposed pictorial spread.

Agricultural Gazette production economies have been effected by: gradual deletion of advertisement pages; reducing the *Gazette* from 96 to 64 pages; adoption of saddle-stitching in lieu of side-stitching (labour thus saved will speed the binding and deliveries); and the system of sending to the printer the *Gazette* layout with all material, thus obviating the cost of galley proofs.

Revenue from the *Agricultural Gazette* subscription list may be increased by the Printer's action in increasing the annual subscription from 12s. p.a. to 24s. p.a. (including postage) as from January, 1963. The effect of this action on the subscription list is not yet known.

Press Copy.—The weekly *Press Copy* carried 418 articles and 31 blocks, as against 520 articles and 41 blocks in the preceding year. A trend towards featuring at least one lengthy article in each issue left less space than usual for other articles; and one issue was entirely devoted, experimentally, to one article and five supporting illustrations—all concerned with Serrated Tussock. The response by newspapers to this feature has consolidated a place for this method of treatment of deserving topics. Some rural papers printed a special supplement.

Stereo loans to newspapers totalled 75, compared to 80 in 1961-62.

Press Copy: Timeliness of Despatch.—Newspapers' and Radio and T.V. stations' receipts of the weekly *Press Copy* have improved by changing day of publication from Friday to Thursday of each week. The sheet is still date-lined Friday but delivery of copy to the Printery, and printing and despatch, have been brought forward by one day. There is now no Friday clash between Printery despatches of *Press Copy* and *Government Gazette*. In the past this sometimes led to delay of *Press Copy* despatches from Friday to Monday or Tuesday.

Roneoed, Press Releases.—Roneoed press releases further declined, to 27 as against 42 in 1961-62. This type of Head Office release is in the main from the Minister's office.

To improve the presentation of miscellaneous, roneoed press releases (from Head Office and Regional offices) a printed top sheet with a Department of Agriculture Press Release letterhead has been designed and requisitioned. A variant has been designed for the Regional offices' releases. A survey of Regional opinions is proceeding, to ascertain paper sizes (for news releases) preferred by newspapers and radio and T.V. newsmen.

Miscellaneous Publications.—Material for 169 miscellaneous publications was edited and sent to the Printer, 20 less than in 1961-62. The printery returned 213 miscellaneous publications (excluding stationery), as against 303 (excluding stationery) in 1961-62. There are now 90 jobs with the Printer, compared with 94 a year ago.

Meantime the Editing Section has 103 jobs in hand, for preparation for printing, 60 more than was so a year ago; and another 119 are in author Divisions for technical revision, compared to 100 a year ago. The increasing arrears reflect two vacancies in the four Editorial Assistant positions.

Weeds Book.—The compiler Mr. J. N. Whittet is now producing a 2nd Edition, under contract. The 1st Edition's first impression (5,000 copies) was sold by the close of 1961-62. A second impression (1,500 copies) has been received from the printery to bridge the period of waiting on the 2nd Edition.

Pastures Book.—First and second proofs of the "Pastures" book have been checked and returned to the printery. Third proofs were received late in June, 1963.

Dairy Farming in Australia (N.S.W.) 2nd Edition.—Revision of "Dairy Farming in Australia" (N.S.W.) for a 2nd Edition is proceeding in technical Divisions. This is a Commonwealth Department of Primary Industry project.

Sales of Publications.—Since the 1st Edition of "Weeds" 42s. became available for sales in December, 1959, revenue from sales of this book has been in the vicinity of £9,500. In 1962-63 it has been about £950. Of the 1,500 second impression copies of the 1st Edition, in stock only since February, 1963, 599 have been sold (including 71 by the Government Printer's Sales Centre).

Revenue from sales of other publications in 1962-63 is estimated at £1,152 compared to £982 in 1961-62. Less than 2 per cent of the titles in the Department's literature range are saleable items.

Advertisement Space Sales.—Gross income for 1962-63 from *Agricultural Gazette* space is estimated at £8,441, almost £5,000 less than in 1961-62; and for space in other publications the estimated £105 revenue is about £215 less than in 1961-62. The figures reflect the decision recorded in last year's report, to wind-up the business of advertisement space sales. There will be a carry-over of the business into 1963-64, but probably all contracts will have been fulfilled by the time the August, 1963, *Gazette* appears.

Publications Distribution and Inquiry Section

Inquiry Section.—Excluding the Home Gardens Inquiry Officer's work (see later heading) the Inquiry Section office assistants handled 45,552 requests for information; 9,116 more than in 1961-62 when the Inquiry Section's room was closed to the public for 4-5 months (July-November, 1961) whilst reconstructions proceeded.

The 45,552 handled in 1962-63 is still little more than half the total handled in 1960-61 and recent earlier years. Therefore it would seem that the purposeful steering (see last year's report) of rural postal inquirers towards the Department's Regional and District offices for subsequent service is effective. The inference is supported also by figures under the "Publications Distribution" heading (see later).

Of the 45,552 requests in 1962-63: 7,294 were telephoned (4,237 in 1961-62, when the office was "off the air" for 4-5 months), 17,116 were postal (20,788 in 1961-62), and 21,142 were in-person (11,411 in 1961-62, when the office was closed to the public for 4-5 months).

Publications Distribution.—In response to requests from the public, and requests from country offices of the Department for bulk supplies, the section distributed 843,790 publications; 166,123 more than in 1961-62. The increase may reflect the fact that the section's services were handicapped for 4-5 months (July-November) of 1961-62 by closure for reconstructions.

An interesting trend noted in last year's report has continued, indicating the rural public's increasing awareness of the Department's decentralised offices. In 1961-62, a total of 458,473 items was despatched to country offices whilst only 219,194 items were issued direct to the public. That was the first year wherein the major part of total distribution was to country offices as against to members of the public direct. In 1962-63, of the 843,790 items of literature distributed, 675,045 were in bulk responses to country offices' requests for supplies whilst only 168,745 were issued direct to the public (50,499 less than 1961-62).

Home Gardens Inquiry Officer.—Dealing with home garden inquiries that office assistants in the Inquiry Counter Section were unable to handle by use of the literature range and that would have been sent on to technical sections of the Department if there were no H.G.I.O., this officer handled 6,544 requests for information: 3,283 telephoned, 1,252 postal, and 2,009 in-person requests. His total for the preceding three years were: 6,647 in 1959-60; 6,822 in 1960-61; 6,455 in 1961-62; a continuing heavy workload for one officer.

He has commenced work on a Chart of Control Measures for the Common Insect Pests of Ornamental Plants, and hopes also to include diseases. The product will be for ornamentals the parallel of the Vegetable Spraying Guide and the Orchard Spraying Guide produced by other units of the Department.

Library Services

The main library continued to be used frequently by the public, and good relationships with other libraries were sustained by generous inter-library loans, but in the main the Departmental libraries were concerned with intra-Departmental services to research and extension.

Accessions.—These totalled 17,585 items comprising: 763 books; 11,373 periodical issues; 4,864 pamphlets (4,222 in series, 298 catalogued, and 344 arranged by subject); and 585 annuals (49 bound volumes and 536 unbound).

The accessions total was 739 less than in 1961-62 and 710 less than 1960-61, but this is not significant. Rates of receipt of bulletins, reports, etc. on exchange, fluctuate.

Of the 763 books accessioned, 82 were purchased from Commonwealth Extension Services Grant funds, for location at country offices. There are now 19,036 books from this source at 76 locations.

Also, 42 of the 763 books were for Wagga Agricultural College and 104 were for Hawkesbury Agricultural College; purchased from Library Trust funds built up by students' subscriptions. Using these funds, thirteen new subscriptions were placed for periodicals—one for Wagga and 12 for Hawkesbury College.

The C.R. funds allocation for "books, periodicals, newspapers" was £3,800 in 1962-63, £500 more than in 1961-62, but for periodicals subscriptions alone the standing annual commitment now exceeds £2,500.

Central Library Loans.—Items loaned totalled 29,650; 4,068 less than 1961-62, and 2,264 less than in 1960-61. Of the items loaned, 22,748 were periodicals on circulation (Av. 437 per week) and 6,911 were miscellaneous loans (Av. 133 per week).

Of the 6,911 miscellaneous loans: 5,456 were direct to officers from the Department's library resources, 1,117 were to other libraries, and 338 were from other libraries for loan to Departmental officers.

The lower loans total by comparison with 1961-62 and 1960-61 is explained largely by a lengthy illness of the officer (since retired) formerly responsible for circulations of periodicals to officers. Significantly, the "miscellaneous loans" increased.

Inter-library Loans.—These continued to be considerable. Much more was loaned by than borrowed by this Department: 1,117 items loaned to and 338 items borrowed from other libraries. This reflects the comprehensive and acknowledged wider coverage in the Department's collections.

Inter-library Lending Committee.—The Department's Librarian-in-Charge was this year appointed as a member of the Inter-Library Lending Committee of the Australian Advisory Council on Bibliographical Services. The 1963 report of this body will have far-reaching effects on inter-library lending procedures throughout Australia.

Library Information Bulletins.—Twelve were compiled and distributed to officers throughout the Department; two more than 1961-62. Their total of 180 pages listed/classified 2,231 items of select accessions. Each bulletin also included a note of literature searches done in the preceding month; to widen the use of search lists compiled in response to specific requests.

Photo-copying Service.—Jobs totalled 463, involving 3,903 sheets; compared with 383 jobs and 3,698 sheets in 1961-62. Public Works Department's service has also been used, for multiple and large orders, to reduce the load on the library's machine.

Exchanges Arranged.—These, reciprocal for the *Agricultural Gazette of N.S.W.* or the Annual Report of the Department, included: the quarterly *Journal* and the *Advisory Circulars* and *Annual Reports* of the Rubber Research Institute of Ceylon; Finland's *Annales Agriculturn Fenniae*; and Hungary's *Agrochemistry* and *Soil Science* and *Agrobotanika*.

Help for Branch Libraries.—Librarianship assistance was given, part-time, in the branch libraries of the Dairying, Horticulture, and Marketing and Agricultural Economics Divisions; and a full-time service was continued at Hawkesbury Agricultural College, Royal Botanic Gardens and National Herbarium, the Science Services Division at Rydalmere, and, jointly, the Animal Industry Division head office and Glenfield Veterinary Research Station libraries.

Inspections were made, advice was given on the spot, and written recommendations were provided, in respect of the libraries at Yanco Agricultural Research Station, Leeton Agricultural Research Station and the South Western Regional Office at Leeton.

Improvements in the libraries of the Agricultural Research Institute, Wagga, and the Wagga Agricultural College and their service will follow the appointment of a librarian to take charge of them. This is a new position. The appointee will take up duties in July, 1963. Attention will be given also to the library at the Southern Regional Office, Wagga.

Bindings Service.—In the Library Service there is a big backlog in assembly and preparations for binding. Hundreds of volumes of periodicals were not previously considered for binding. Many of the sets are unique and should be permanently preserved by binding, but it is a type of work that tends to be put to one side in a busy library service except where staff strength permits otherwise. The current staff are trying to overtake this lag.

Binding has proceeded regularly for series held by the Agricultural Research Institute, Wagga, but has become a critically important need in most of the country collections. Some of the periodicals held there are the only copies owned by the Department. Distance from the binding service is a delaying factor.

The Government Printer recently convened a conference for Departmental representatives, on binding. Better knowledge of binding difficulties has resulted. Varied and improved methods will now be used to satisfy needs.

Audio and Visual Aids Sections

PREPARATIONS FOR TELEVISION

The Extension Officer (Photographic Aids) and the Extension Officer (Radio) have worked together to establish TV film making as a function of the audio/visual aids sections. This has been a year of gaining experience. Their production may be summed up as six experimental films of three to four minutes running time. Although experimental, one has already been used by TV channels.

The aim of this new function is to produce each year enough short films to help field officers fulfil commitments they will accept from rural TV channels.

Advice has been given to groups of field officers; on TV presentations, and on planning of programmes wherein local "live" material, their 35-mm. slides and prints, and the cine film footages acquired by cameramen employed by the TV channels will be mainstays. The advice has included guidance on how a technical field officer authoritative on subject-matter may brief a cine cameraman for footage to be used in a TV session.

PHOTOGRAPHIC AIDS SERVICES, CINE AND STILL

Field Officers' 35-mm. Photography.—This yielded 8,400 black and white exposures, 3,360 more than in 1961-62; and 7,600 colour exposures, 1,200 less than 1961-62. The total of black and white and colour exposures was 16,000, an increase by 2,160. It reflects a greater number of cameras and field officer camera-users.

Continuing tutorial advice or constructive comment to field officer camera-users, 660 forms were sent by the photographic aids section to field officers with the returns of their processed slides.

The photographic aids officer also made tutorial visits to Inverell and Tamworth, including the Agricultural Research Station, and he accepted advisory chances at other centres in the course of visits made primarily for other purposes such as cine camera work for television films.

Increased black and white work by field officers, and the decrease in colour work, reflect in part the field officers' growing awareness that good black and white photographs make better block copy for publications than do colour shots. The officers are conscious also of the need to build up good black and white slide and print series for use in rural television programmes. Since Channel 8 began telecasting at Orange the Mid-Western Region alone has had 803 diapositives prepared specially for TV use.

Special Assignments.—Twenty special photographic assignments were done by the photographic aids officer or his technical assistant. Amongst these was the photography at Rockley to acquire shots that would suit a 10 ft. x 7 ft. enlargement mural on Serrated Tussock at the Royal Easter Show.

Special enlargements, and/or colour slide series for use in automatic projectors, were supplied for fourteen displays: the Royal Easter Show; Bathurst, Orange, Cowra, Narrabri, Wee Waa, Grafton, Glen Innes, Maitland, Gunnedah, and Lismore shows; the Agricultural Research Institute display, Wagga; and an Argentine Ants Campaign display. The total of all enlargements printed, ranging from 3½ in. x 2½ in. for block making to 20 in. x 16 in. for displays, was 1,032.

Cine Filming.—This year it was confined to the experimental series of shorts, of three to four minutes viewing time, for potential use in rural television programmes.

CINE FILM LIBRARY

Fewer Loans.—Last year's report noted "a surprising increase in film loans; 884 programmes collated, and 1,913 films loaned therein; compared to 521 programmes, 1,151 films, in 1959-60 and 627 programmes, 1,298 films in 1960-61" and "near to two million feet of film checked, and repaired where needed, in the course of despatches and returns".

This year there has been a significant decline in film loans and the attendant checking/repair work. Only 269 programmes were collated, involving 644 film loans and 634,200 ft. of film checking/repair work.

The explanation offered is that in areas where field officers' film projection itineraries or Agricultural Bureau branch screenings were previously notable forces in film borrowings there are now effective rural television channels: Lismore Channel, affecting the upper north coast, Orange Channel affecting the central tablelands and mid-west, Wollongong Channel affecting the Illawarra and upper south coast, Newcastle Channels affecting the mid coast and Hunter Valley areas, Canberra Channels affecting the southern highlands and parts of the Monaro, and the metropolitan Channels affecting an extensive area out of Sydney.

Added Films.—Twelve new prints (each a title new to this library) were added; making a total of twenty-three new prints (eighteen new titles) for the two years 1961-63. The twelve new titles this year comprised:—Cream Separator, Handling and Storing Apples in Pallet Boxes, Count Ten and Live, Why Tractors Overturn, Apple Handling Methods, and Salt Land Management, all supplied free by Department of Primary Industry; Raising Dairy Calves, Dairy Husbandry, and Raising the Dairy Heifer, all supplied free by the New South Wales Milk Board; Harvesting for Profit, supplied free by William Cooper & Nephews (Aust.) Ltd.; and Gift of Green, and Film Tactics, each acquired by purchase.

Film Library Catalogue Revised.—The 1957 catalogue has been brought up to date and will be ready for issue later in 1963. It may have a stimulating effect on film borrowings.

Television Usage of Library Films.—Use of the Department's film library holdings, in farm sessions when Department of Agriculture officers are active participants, has been examined to ascertain the conditions under which the respective film's production authority would permit such use and with due regard for various copyrights. The conditions have been collated, and despatched to Regional and District offices of the Department throughout the State.

RADIO AND SOUND SECTION

Forty-two Rural Radio Stations Involved.—At least 42 of the rural radio stations in New South Wales have one or more farm sessions per week, wherein Department of Agriculture officers or material supplied by them are featured. The report of the Chief of Regional Extension Services, incorporating annual data from the Regional and District offices, would yield a closer statistical picture of the extent of radio usage by the Department's field staff.

Recordings from Head Office.—107 recordings were made at head office, 51 more than in 1961-62, to supplement country officers in their local farm radio sessions. In the 107 were 85 talks or interviews by the Women's Extension Service, reflecting the fact that there is no women's extension staff stationed at field addresses, and 22 by technical subject-matter authorities. A comprehensive multiple tape-copying service has been maintained, to expedite flow of head office recordings simultaneously to each Region.

Added Sound Equipment for Field Offices.—Additions to the audio and audio/visual aids equipment of the Department's extension workers this year included: two transistorised portable tape recorders (for "pilot" experience), 10 transistorised 10-watt portable P.A. systems (for "pilot" experience in each Region and at head office), one portable P.A. unit of one watt output for use on smaller audience occasions, such as a fruit-tree pruning demonstration, and three portable one-piece 16 mm. cine film projectors.

Co-operation in TV Work.—Co-operation with the photographic aids officer in preparation of short cine films for television has been part of the radio officer's work. He has scripted the films, and provided the voice for sound track contents, for final matching with film originals.

Recorded Examination Matter.—Facilities have been made available to Personnel Section to record and copy on tape a series of lectures for Reg. 119 Examination candidates stationed in country areas.

DISPLAY ARTIST/DESIGNING SECTION

Production followed the normal pattern. The major display job was the Department's Royal Easter Show exhibit and information bureau. Part of the subject-matter and display materials, concerned with Serrated Tussock, were erected later at Bathurst Show by the display artist and Bathurst Experiment Farm officers. Subsequently the materials were moved to Orange for a window display.

Heavy assignments of sign- and ticket-writing were executed for several country offices: among these, the Agricultural Research Institute, Wagga, for its forthcoming Science Week exhibition, and the Southern Regional office for use at several shows in the Region.

The Women's Extension Service needed a lot of teaching aids for use in short-term schools/courses and other rural conventions, and was the major recipient of teaching aids help.

HELP TO OTHER DEPARTMENTS AND AUTHORITIES

The Audio/Visual Aids Section has been able to: loan studio interviewing/recording facilities to visiting interviewers from the Australian Broadcasting Commission and other radio networks; provide a public address system and tape recording for sessions of World Poultry Science Congress in Sydney, organised by Department of Primary Industry; record a commentary for a 20-minute training film of the Water Conservation and Irrigation Commission; provide studio recording facilities for a radio interviewer representing the United Wheat and Wool Growers' Association; copy tape recordings for the Department of Health; make tape recordings for the Minister for Child Welfare, Minister for Labour and Industry, Minister for Lands, and Minister of Justice; provide tape recording and P.A. facilities for the Commercial Apiarist Association's annual conference, the Australian Veterinary Association's annual conference, the Commonwealth Extension Services Conference at Hawkesbury Agricultural College; provide script re-writes and tape recordings for Department of Taxation use in rural radio sessions; advise the Civil Defence Authority on 16 mm. cine camera suitabilities; design an exhibit for the Argentine Ant Eradication Campaign for Department of Local Government, arrange photography for the purpose and write copy for and give guidance to a display firm, etc.

The Agricultural Bureau ("Extension Groups")

The Agricultural Bureau section has been short of one assistant organiser (of three), who is at Oxford University for 18 months' post-graduate studies; and has been handicapped by the Division's need to use some of the time of one other assistant organiser for short-term schools/courses organisational help to other parts of the Department. The

effect has been inability of the Division to accept all opportunities to increase Bureau branches and improve Bureau activity programmes.

Branch Affiliation Fees and Numbers.—Twelve new branches formed; six branches disbanded; the number of branches financially affiliated with the Agricultural Bureau State Advisory Council fell from 170 to 164.

Change of period of the Annual State Congress of branch delegates, from the traditional July dates to May, through the altered vacation periods of Hawkesbury College, has affected Bureau branches' affiliation attitudes. For many branches the May Congress is too inconvenient for delegate attendance. This being so, the respective branch has one less reason for affiliation. However, it does not necessarily reduce the usefulness of the branch as an extension group in the locality.

The 1963 State Congress resolved to raise branch affiliation fees from 6s. to 10s. per full member; 7s. for the Advisory Council and 3s. for the Regional Council of the respective branch.

State Advisory Council.—All 10 Regions of the Bureau were represented in the State Advisory Council this year, and five of the 10 had two Councillors—one for each of two Divisions in the respective Region. For South Western Region the Councillor was a nominee of the associate body, the M.I.A. District Council of Extension Groups.

The 15 male councillors, two Women Councillors (one for North and for South), and the President and Past President, made a Council of 19 members. Attendances over the four meetings averaged 72 per cent of the possible maximum.

State Congress.—Held in May, 1963, at Hawkesbury Agricultural College, the three days' educational programme jointly organised by the State Advisory Council and the professionals in Division of Information Services was a success. Delegates totalled about 160, a definite improvement on the 1962 attendance when the May vacation was first used, but the effect of the change from July to May after almost 40 years of holding the Congress in July was still marked.

Bureau Regional Conventions.—Ten Conventions were held at rural centres, under Bureau Regional or Divisional sponsorship. Attendances ranged from 80 to 220 people. The more specialised and technical programmes typical of Bureau Conventions in recent years continued to promote worthwhile types of audience and good discussions.

Bureau Schools/Courses.—Demand for and success of three-day *Leadership training schools* at country centres were features of the year's activities. The schools were held at Rye Park, Cowra, Mudgee, Orange, Bathurst, and Quandialla; each sponsored by a local Bureau and staffed by Agricultural Bureau organisers or the women's extension service personnel. A C.W.A. leadership school at Deniliquin was similarly assisted.

Other types of short-term school or course conducted by Bureau units this year comprised: a five-lecture course (one per week for five weeks) on *Soils and Botany* at Nambucca; an *Advanced Soils and Botany* course at Coff's Harbour, and a *Pasture Management* course at Trundle, each of which followed a previous year's soils and botany course at the respective centre; a four-days' *Farm Management* school at Cootamundra; a *Farm Management* course at Mangrove Mountain; two *Beef Cattle* schools, at Muswellbrook and Bombala; a *Cereal Production* school at Bogan Gate; and three *Tractor* schools, at Missabotti, Dorrigo and Dalgety.

Bureau branches and members also continued their support of schools promoted by other agencies.

Schools for Bureau womenfolk are mentioned under the Women's Extension Service heading.

Branch Activities.—Bureau branches' reports show that branches in general continued to hold meetings at the rate of 10 to 12 per year and that at most meetings the special or main business was a lecture, discussion group, film screening plus discussion, question panel, or debate. Almost every branch conducted one or more field days. The trend has been towards a "one subject, field afternoon" and away from the "multitudinous subject-matter" type of field day so typical of earlier years.

Women's Extension Service

Group Work.—The section was concerned in eight short-term schools or courses on aspects of homemaking, two more than in 1961-62, and provided organisational work for (and twelve of) the twenty-nine sessions for women's programmes at fourteen conventions and field days of the Agricultural Bureau. Officers of the section addressed twenty-nine meetings of Agricultural Bureau branches and seven meetings of C.W.A. branches and church groups.

Mass Media.—Women's Service copy appeared in forty-two issues of the Department's weekly *Press Copy*, compared to forty-six issues in 1961-62; but meantime there were eight articles and seven groups of notes in the new *Farm Home* segment of the *Agricultural Gazette of New South Wales*, a segment which did not exist in 1961-62. A booklet on Home Freezing is also at an advanced stage of preparation.

The section also made eighty-five tape recordings for use by rural radio stations; fifty-three more than in 1961-62.

Short-term Schools/Courses, in General

The position of Extension Officer (Short-term Schools/Courses Organiser) has in effect been vacant since October, 1962, when this officer was "seconded" to the position of Supervisor of Courses at Yanco Agricultural Research Station. Some help to other parts of the Department in organising schools has been possible by using part-time one of the Agricultural Bureau assistant organisers.

Many opportunities to promote schools or courses have had to be missed; and specialist collection and collation of detailed information and experience from schools virtually ceased.

The 1961-62 report noted that "of seventy-one short-term schools or courses, seven were in-service training schools promoted by various Divisions of the Department, fifty-three were schools for farmers, and eleven were courses for farmers (one night per week for five or six weeks) . . .".

In 1962-63 only forty-four schools and courses were promoted by the Department of Agriculture and/or the Agricultural Bureau. Ten of these were in-service schools/training conferences. Thirty-four were schools or courses for farmers, and twenty of these were Agricultural Bureau undertakings.

In effect, the extent of promotion of schools/courses for farmers has rapidly reverted towards the thirty-five of 1960-61, the year wherein the then newly created "Extension Officer (Short-term Schools/Courses)" position started to affect this much in demand line of extension activity.

Extension Service/Extension Methods Training: and Examinations

Four schools were conducted by Division of Information Services. One was the eleven days residential in-service school for forty Departmental officers; held at Hawkesbury College, in January, 1963. Another was the five days course at Wagga Agricultural College, for 3rd Year students, in February, 1963. Another was for University of Sydney 2nd Year Agriculture students, sixty students, five days, in June, 1963. The remaining one was for University of New England 2nd Year Rural Science and Agricultural Economic students, fifty students, six days, in August, 1962.

A Reg. 124 Examination paper on Extension Service was set and marked as required by the P.S.B. for field officer candidates for higher salary grades.

Representation in Boards/Councils

The Chief of Division of Information Services continued to represent Agriculture in the New South Wales Advisory Board of Adult Education and the New South Wales Film Council.

The Agricultural Bureau Organiser continued as a State Councillor of New South Wales Junior Farmer Clubs. The Agricultural Bureau State President (Mr. L. B. Geelan) represented the Bureau in the New South Wales Council of Co-operative Societies, and the Bureau was represented also in the New South Wales Chamber of the National Farmers Union.

The Senior Extension Officer (Women's Service) represented the Agricultural Bureau in the Organising Committee for the 10th Triennial World Conference of the Associated Country Women of the World, and in the Bush Nursing Association Council; and represented the Department in the sub-committee of the New South Wales Division of the National Safety Council of Australia.

REGIONAL EXTENSION SERVICES

It is now ten years since the first of the established nine Agricultural Regions was inaugurated, bringing into effect decentralised supervision of the extension services of the Department. Each Region comprises a number of shires. The Regions average 7,000 primary producers. A Supervisor of Agriculture is in charge of each Region. Regional headquarters are Cowra, Goulburn, Gunnedah, Leeton, Lismore, Maitland, Orange, Tamworth, and Wagga.

Personnel in Regions

Numbers.—Of the 417 officers stationed at country towns for advisory, regulatory and allied services to primary producers, 371 are within the Regional administration system. Exceptions in the main are veterinary personnel, Division of Animal Industry.

Additional Appointments.—Other officers appointed to Regions this year included a farm machinery officer (Western), a fruit officer (North Coast), an economics research officer (South Western), and a herd recorder (South Coast and Tablelands). A livestock officer (poultry) appointed to Gosford (not within a Region) operates also in Mid-Coast and Hunter Region.

Accommodation of Personnel.—There has been a big improvement in recent years in office accommodation for Department of Agriculture rural officers. It would be difficult to better the standard and location of most of the Regional headquarters officers, particularly those at Wagga, Orange, Leeton, and Goulburn.

The following offices are some where improvements occurred in the past twelve months: Bathurst, Coff's Harbour, Cooma, Cootamundra, Cowra, Deniliquin, Finley, Glen Innes, Goulburn, Leeton, Lismore, Mullumbimby, Orange, Tamworth and Taree.

The Regional Economics Research Officers.—Agricultural economists (three) are now stationed in the Southern, South Western, and Northern Regions. Their responsibilities include instruction and assistance to other officers in their advice to farmers on economic and farm management problems, collection of economic data as a basis for management advice to farmers, and some direct extension service though this tends to be mainly by group methods including lectures, discussion groups and short courses on farm management factors.

The Farm Machinery Officers.—There are now two; one at Leeton and one at Orange. There will be another, at Wagga, early in the new financial year. There has been a big call on advice from these new officers. An indication of the range and volume of their work is reported under the "Farm Machinery Advisory Services" heading of the Experiment Farms and Stations Branch section of this Report of the Department.

In-Service Training of Officers for Extension.—A system to improve the training of officers for extension work has been inaugurated. The goals are: (a) intensified in-service training, to help young personnel to become more proficient, within a shorter period, for extension work, (b) a reserve of extension personnel (i) to ensure that all established Districts are staffed continuously and (ii) to permit establishment of new Districts.

Officers "in training" will be attached to Regional offices, not to undertake advisory duties but to receive experience and training in:—general extension methods—planning programmes, approach, inquiry, and advice; organisation and conduct of field days, farmer schools, and conferences; radio, television, press writing; public speaking; judging competitions; water testing; attention to written, verbal, and telephone inquiries; preparation of reports, and dealing with official correspondence; record-keeping; preparation of vouchers, requisitions, and other returns; and general office administration.

The training period will extend from one to twelve months. Already five trainee agronomists have been located with Regional Supervisors. They are at Wagga, Goulburn, Tamworth, Maitland, and Orange.

Conference of Regional Publicity Officers.—The nine Regional Publicity Officers attended their first full conference, at Head Office in September, 1962. Their discussions of vital aspects of agricultural communication were helped by Professor Hadley Read, an agricultural communications authority from the University of Illinois, United States of America. In fact the Publicity Officers' conference coincided in part with a three days seminar promoted by Division of Information Services, with Professor Read as a seminar leader.

They visited also the Australian Broadcasting Commission's Television Channel 2 at Gore Hill, to advance their experience of a medium that is about to become a major element in rural areas.

Schools, Field Days, and Conventions

Short, farmer schools at country centres other than at Departmental institutions are an increasing force in extension and have gained impetus as an effect of Regional organisation. Typically the schools extend for three days, but some are of four or five days duration. They deal respectively with a particular feature, e.g.: pasture management, beef cattle, sheep, fruit packing, bee keeping, farm management. In the short period since appointment of agricultural economists to Regions, farm management schools have been held at five centres, and there is demand for many more than staff may handle. The Agricultural Bureau has co-operated in organising all types of schools.

Some of the schools, field days, and conventions organised by regional officers are listed hereunder.

Serrated Tussock Course.—A two-day course on Serrated Tussock was held at Queanbeyan. The seventy persons in attendance included representatives of local government, and other organisations in whose areas the weed occurs, local landholders, and some field officers. All Councils for areas with infestations were represented. The Victorian Vermin and Noxious Weeds Destruction Board sent a member and a senior research officer.

Cotton Field Days.—There is now great interest in cotton growing in appropriate areas. Cotton field days were organised in the North-Western and South-Western Regions. For the four field days held in South-Western Region, total attendances exceeded 1,000 persons.

Dairy Hygiene Field Days.—Over 100 dairy hygiene field days, comprising mainly practical demonstrations, were conducted by dairy officers in Regions. Attendances averaged 30 dairy farmers, and their response revealed the dairying industry's increasing appreciation of the need of high standards to assure good quality milk, butter, cheese.

Fruit Packing Classes.—Following a very successful fruit-packing course in the Orange district early in 1962, when 110 persons received tuition, similar classes were held this year in the Bathurst and Batlow districts. At Bathurst, 40 persons attended for the full period. At Batlow, where the course extended over three weeks, the attendance was 93 and most were orchardists.

Bee-Keeping Schools.—There has been striking interest in bee-keeping schools, exemplified by the attendance of 80 people for the three nights of a school at Lismore. Arrangements are in hand to hold three more bee-keeping schools in the spring of 1963.

Pasture and Stock Husbandry Schools.—Schools on beef cattle and pastures, or sheep and pastures, have been very popular. Many of these have been arranged by the Department of Agriculture in co-operation with local farmers' organisations and agricultural societies. One held at Crookwell was in conjunction with the local Rotary Club. Most of these schools have extended over three days and attracted an attendance of from 40 to 80 farmers each. Department of Agricultural officers, providing the teaching force, have in many instances been supplemented by officers of other Government Departments and the C.S.I.R.O. and also by authorities from external organisations including Universities and corporate commercial institutions.

Co-operation with other Departments

Co-ordinated Extension Services.—A co-ordinated Extension Services Scheme came into operation a few years ago as a means to help make full use of appropriate public service officers who are located in rural areas and have agricultural training. Under the scheme, Department of Agriculture extension officers, Soil Conservation Service officers, Rural Bank valuers, and N.S.W. Milk Board field officers, col-

laborate in making advice available to primary producers. Officers of the Department of Agriculture provide personnel of the other organisations with Departmental publications and information concerning pasture, crop, stock, and allied matters.

Regional Development Committees.—Most Agricultural Region Supervisors and some of the district extension officers are members of the Regional Development Committee for the area, set up by the Department of Industrial Development and Decentralisation. Three Agricultural Region Supervisors are Chairmen also of the Development Committee for their area of the State.

Assistance to Junior Farmer Movement.—Officers throughout the State have assisted Junior Farmer activities, by lectures, field day organisation, guidance in Junior Livestock Judging events, debate adjudications, etc. Many local J.F.C. Advisory Committees include officers of the Department.

Fauna Protection.—During the year, all Regional Supervisors were asked to assist visiting officers of the Fauna Protection Panel of the Chief Secretary's Department. As a result, both pre- and post-visit publicity was given in all Regions and rooms were provided for local consultants. Recently, too, the Mid Western Regional Publicity Officer recorded eight 5-minute radio sessions for use in the southern half of the State; and made these recordings available to each other Region. Other material, including literature, posters, and small cards were distributed for the Panel; and talks to schools and service organisations were arranged.

Flood Relief Assistance

Arising from the year's incidence of serious coastal floodings, over 1,400 claims for relief, from farmers and householders, have been investigated and forwarded to the N.S.W. State Flood Relief Committee. In the case of about 500 claims submitted by share and tenant farmers, investigations were made and reports submitted by Department of Agriculture extension officers. So great was the pressure in the Grafton district, that it was in fact necessary to locate four more officers there for a period of expedite the work on claims.

Flood relief work by officers included distribution of fodder to farmers. At Grafton, about 500 tons of fodder arrived by air, road, and rail, including 200 tons donated. Department of Agriculture officers undertook distribution of the fodder to the 200 farmers in distress.

Regional Publicity

Each Region has a Publicity Officer, to help the preparation of material and arrange its availability to all appropriate publicity channels.

Press.—The total of press releases by all Regions has typically exceeded 3,000 this year. The releases were to all newspapers and radio stations in the Region. In some instances, the mailing list includes newspapers and radio stations outside the respective Region. Surveys by Regional publicity officers into the extent of press usage of the releases have indicated that the individual newspapers range from 50 to 90 per cent usage.

Radio Broadcasts.—The 48 radio stations in rural areas of New South Wales use material supplied by regional officers, but in addition not less than 42 of the stations broadcast regular Department of Agriculture sessions for the men on the land. Many are commercially sponsored sessions.

The number of broadcasts per week and the total radio time occupied vary from Region to Region, but the average per Region is a total of 1½ hours per week spread over acceptable listening times.

Mid-Western Region provides a fair example. This year the Region provided 913 individual broadcasts, over four radio stations, and occupied a total of 94½ hours' air-time. It would be difficult to assess the cost of this air-time if purchase were involved, especially since most of the broadcasts were at night. However, on a conservative evaluation at £20 per hour it is apparent that free radio time in the Mid-Western Region alone would have cost the Department about £2,000 if payment had been necessary.

Television.—In the west television is now a component of the Department's extension services. This is evolving also in other areas and will consolidate as new rural television channels become established.

In March, 1963, an agricultural extension programme was telecast over CBN Channel 8, Orange by officers of Western Region. Its success showed that the decentralised extension services could effectively handle the challenge of television. In consequence, a regular commitment to the channel was undertaken.

The first regular fortnightly television programme was on 4th June, 1963 at 8.30 p.m., an excellent viewing time.

Channel 8 viewing covers two Regions, the Western and Mid-Western. Therefore the two are co-operating in conducting their "Farming Today" session.

North-Coast Region has provided the Lismore television channel with material from the outset of the channel. It was used in news sessions or as "fillers" at appropriate times. In May, 1963, the Lismore channel commenced a regular agricultural session of 10 minutes and north-coast officers, of the Region and the Wollongbar Agricultural Research Station, have contributed a lot of the subject-matter. Organisation is in the hands of a member of the television station staff. He co-operates closely with the Department's Regional publicity officer, and the station makes available a cine cameraman to film matter suggested by extension officers either for the daily news sessions or the regular agricultural sessions.

All Regional Supervisors appreciate that television will be operating in their Regions and affecting their work programmes within the next two years. Besides commercial channels there will be Australian Broadcasting Commission rural channels. Liaison has already been entered into with A.B.C. rural staff.

Libraries and Pamphlets.—There are 2,200 reference books, valued at £4,000, in Regional and district office reference libraries throughout the State, for the use of officers affecting extension. Recent additions included a number of reference books on writing for communication.

During the year, 680,651 items in the Department's range of extension booklets and leaflets were distributed from Head Office to Regional and District offices for extension distributions in rural areas.

Regional Advisory Committees

These Committees, made up of selected farmers in each Region, met regularly and continued to provide important liaison with primary producers' thoughts on extension and research.

As an example, the Mid-Western Regional Supervisor reports Committee satisfaction with a number of important extension and research regional matters that have been brought to notice by it with significant results. An allocation of Wheat Industry Research funds (£10,000) for wheat research in the central west was one of the major satisfactions of the Committee this year.

Another example, from the Southern Agricultural Region Advisory Committee, arises from concern it expressed at the position of the apple and pear industry in the Batlow district. As a result, an economics research officer is now making a research survey of the industry. He is studying costs and returns of Batlow orchards, investigating relationship between orchardists and packing houses or cool stores, and examining the market structure for apples and pears.

Select Notes on Specific Regions

MID-COAST AND HUNTER REGION

Lecture Evenings Innovation.—An additional method of extension has been initiated at Regional headquarters, Maitland, as a further link between the Department of Agriculture and the rural community. The innovation at Maitland is a regular monthly lecture evening. The evening, usually with about 50 people present, comprises an assembly period and inter-mixing from about 7.30 p.m. to 8 p.m., then a lecture by the guest speaker, not necessarily on a technical subject but associated with interests of the man on the land. The lecture and questions occupy about 1½ hours. Then, according to the time available, suitable films are projected and discussed. General fellowship and discussions ensue over refreshments, and the discussions sometimes extend to 11 p.m. or later.

Closer association is being made, and the rural community is increasingly accepting the Regional office as focal point for the farm production matters vital to their interests.

Pasture Research Committees.—The Hunter Valley Pasture Research Committee comprises officers of the Department, a representative of the Hunter Valley Co-operative Dairy Company Limited, and a representative of the Sulphide Corporation Pty. Limited, Boolaroo. This Committee outlines policy and goals of pastures research in the Lower Hunter area, undertaken by the Maitland research agronomist.

Light has been thrown on significant points regarding fertility of the various centres and on the value of various species, strains, and plant associations. The fact that the research is proceeding within the scrutiny of the Lower Hunter farmers strengthens the extension agronomists' work.

The Manning River farmers also have their "Agricultural Research Committee". A District Agricultural Research Council provides funds for the pasture research work in that area, and the work of this district's pasture research agronomist also is productive of results that are strengthening the extension agronomists' activities.

MID-WESTERN REGION

Field Days and Meetings.—Officers of this Region conducted 56 field days and 53 meetings of farmers in 1962-63. Attendances for those 109 functions aggregated 4,970 persons. In addition, 12 short schools for both men and/or women were organised. These were in co-operation with the Agricultural Bureau and other farmers' organisations. The schools included two on tractor maintenance, three on leadership training, two on dressmaking, and one each on irrigation, cereal production, pastures, soils and botany fundamentals, and flower arrangement in the home.

NORTH-COAST REGION

Artificial Stock Breeding Centres.—Some years ago, members of the North-Coast Agricultural Region Advisory Committee undertook a farmer-interest survey in the Lismore area, and subsequently made a strong case to the Agriculture Minister of the day, for establishment of the first artificial insemination centre on the north coast. Now there are five artificial stock-breeding sub-centres operating in the Region. Three of these, Dorrigo, Grafton, and Casino, commenced in 1962-63. Plans are in hand also to operate two more sub-centres, Murwillumbah and Mullumbimby, in the spring of 1963.

Research and Extension Liaison.—Following allocation of considerable research funds from an industry levy by the Australian Dairy Produce Board, to north-coast research into matters affecting the dairying industry, the Department of Agriculture allocated an officer to be Supervisor of Dairy Industry Research, North Coast. In addition, a North Coast Research Council was established. Resultant co-operation between extension and research groups in North Coast Region has been very satisfactory. Regular meetings help to determine the appropriate time to extend new information for farm application.

An example is in the recent work by the researchers in proving the regional value of the sub-tropical legume *Glycine javanica*. There are now 21 farmers' experiment plots sown to this pasture, ranging from one to two acres, in Grafton and Coff's Harbour areas. This was expedited by seed-increase work by the District extension agronomist in association with farmer seed-growers and farm demonstration plots. Ten demonstrations north of the Clarence have been laid down with seed produced mainly at the Grafton Experiment Farm.

NORTHERN REGION

Farm Management Advice.—Appointment of an economics research officer to the Northern Region has been welcomed by extension officers and farmers, but in August, 1963, he departs for two years' post-graduate study in the U.S.A.

A Farm Management School, extending over four days, was conducted in June, 1963, at Tamworth, in co-operation with the Agricultural Bureau. Weather effects on farm programmes interfered with enrolments, but 33 farmers attended for the full period.

Two Farm Management Courses, each extending over four evenings, were conducted. One was at Nemingha and the other at Woolomin. Twenty-two persons undertook each course.

NORTH-WESTERN REGION

Agricultural Bureau Life Membership to Supervisor.—Mr. J. A. O'Reilly, North-Western Regional Supervisor, has been honoured by Life Membership of the Agricultural Bureau of N.S.W. Mr. O'Reilly has been stationed in north-western areas for over 30 years. Throughout that period he has been to the fore in developing and extending wheat growing there, and a strong advocate of the Agricultural Bureau. Many of the Bureau branches in the north-west owe their establishment to his encouragement and drive. Currently there are 22 active branches in his Region.

SOUTH-COAST AND TABLELANDS REGION

Yass Valley Organisation.—Following earlier activities of the Joint Planning Committee (started 1957), the Committee's recommended course of action has taken shape. This has involved the setting up of a representative body designated The Yass Valley Organisation (YVO). It is representative of landholders' organisations, appropriate State and Commonwealth Government Departments and instrumentalities, Universities, Local Government, banks, accountants, solicitors, and commercial firms.

YVO objectives are advancement of primary production in the Yass River Valley and surrounding districts, development of findings of the Yass Valley Study, and provision of a common meeting ground for all sections of the community, to formulate appropriate policies.

Following successful launching of the YVO the Department of Agriculture and C.S.I.R.O. reached agreement for secondment of a C.S.I.R.O. Research Liaison Officer to be Yass Project Officer. His main duties are to implement the Yass Valley Study findings and related research per medium of a project designated "Operation Tintacks". Briefly, it involves planned development of a number of selected holdings. It incorporates in particular the results of recent research findings and, in general, recognised good husbandry methods.

YVO is also seeking and collating information that may encourage landholders to produce more goods for the adjacent, rapidly expanding Canberra market. It is also studying means of reducing stock losses, a serious obstacle to increased wool production in the area.

The Regional Supervisor and District Veterinary Officer are Departmental representatives in the YVO and the Regional Supervisor is Departmental representative in the YVO Executive. Both serve also in the Yass Valley Project Technical Committee appointed by the Director of Agriculture to advise on all aspects of the Yass Valley Project.

Serrated Tussock Campaign.—Additional funds allocated to selected Councils in the Region have increased the chance of more concerted attack on this weed, but greater funds are needed for Councils to gain the upper hand where the weed has become most serious. The need for qualified weeds officers is fairly general and some Councils have taken steps in this direction. One Council proposes to appoint a full-time agricultural adviser.

Several properties in the Anembo and Moss Vale districts where serrated tussock is very dense have changed hands. This could have a good effect, as most of the new owners have capital and are prepared to use it wisely to rid their properties of the weed.

SOUTHERN REGION

Publication—"Research and the Farmer".—No. 1 in a new Departmental publication series *Research and the Farmer* has been produced, and the sub-title for the No. 1 issue was "In the Southern Region". Its contents comprise articles from the Agricultural Research Institute, Wagga; but the production was co-operative as between the Southern Region headquarters, the Institute, and Division of Information Services. Distribution of the publication is in the main to farmers and pastoralists.

The articles included such as "Crop Husbandry in Southern New South Wales", "Cultural Practices for the Control of Wheat Root Rots", and "The Changing Pattern of Oat Varieties and their Utilisation".

Compilation of later issues is proceeding in other Regions, as well as in Southern Region, in accordance with their research station resources.

Film on Seed Certification.—A 16-mm. cine film on pure seed production and seed certification is being produced at the request of the Department. It will be an extension medium and also used as one of the means to advertise overseas Australian-produced agricultural seed. Department of Primary Industry is financing it and the Department of Interior Film Unit is making it. Divisions of Plant Industry and Information Services have collaborated to produce the scenario and organise the filming locations. Southern Region is one of the two largest clover seed producing areas in the Commonwealth. Officers of the Southern Region have given considerable time and interest to assisting production of the film.

SOUTH WESTERN REGION

Agricultural Machinery Officer Appointed.—The first appointment of an Agricultural Machinery Officer to a Region took place in January, 1962, at Leeton—South-Western Region headquarters. His work in the first eighteen months has underlined the value of this type of advisory officer.

During the twelve months under report he made 265 farm visits, gave advice on sixty different machinery problems, made a regular weekly radio broadcast called "What's Your Problem?", over Griffith radio station, and another regular weekly programme "Farm Machinery Corner" over Deniliquin radio station. The broadcasts give farmers answers to written problems, and topical information on agricultural machinery and developments.

The officer has been called upon for most short schools and many field days, to give an agricultural machinery talk or demonstration. He has been used also in other parts of the State, at five short-term schools on tractor maintenance.

The Farmers' Newsletter.—The M.I.A. Irrigation Research and Extension Committee has produced for several years a periodical booklet "The Farmers' Newsletter" at the rate of eight editions per annum—some horticultural and some crop issues. The horticultural issues have a circulation of 1,600, and the crop issues have a 2,400 circulation. Much of the material is by Regional extension officers, including the Italian Extension Liaison Officer. This publication continued to be sustained by officers' contributions of matter in the past year.

Western Region

Television.—Negotiations with the management of the commercial TV Channel 8 at Orange led to a trial telecast on "Fruit Presentation" in March, 1963. Subsequent arrangements were finalised for officers of the Western and Mid-Western Regions to provide a fortnightly television session "Farming Today". This session goes on air at 8.30 p.m., a good viewing time, each second Tuesday. The first in the regular series was on 4th June, 1963. The fifteen minutes' segment in the evening programme includes station introduction and possible commercial announcements, leaving eleven to twelve minutes for the extension material. It has been possible to organise and conduct these telecasts at very little cost to the Department. The response so far indicates that time required for the preparations is well spent.

HAWKESBURY AGRICULTURAL COLLEGE

General

Position of Deputy Principal.—Mr. W. McCarrol retired on 1st February, 1963, after thirty-six and a half years continuous service at the College.

Mr. B. F. Atkins, formerly lecturer at Wagga Agricultural College was appointed Deputy Principal vice Mr. McCarrol.

Developments in the Diploma Courses.—The Agricultural Colleges Advisory Committee has now held four meetings. Certain of its recommendations have been implemented. Others are under consideration.

Examination pass standards have been raised. Deferred examinations are now formalised along the same lines as at other tertiary institutions, for each Year of the three Diploma courses.

A series of thirty lectures in English Expression commenced during the 2nd Term, 1963, for 1st Year students in all courses.

Steps have been taken to introduce in 1963 a grading system (Distinction, Credit, Pass, Fail) in lieu of actual marks in final examination results.

Effectiveness of practical work is to be improved. A full-time Supervisor of Practical Training is necessary for this. The position has been approved and may be filled before commencement of the 3rd Term, 1963.

Changes in the curriculum and in entrance standards, including method of selecting entrants, have been proposed. These will not be implemented fully until 1966 when the first intake of students who have followed the new secondary school syllabus will be received.

The question of the College providing a post-graduate or post-diplomate course in Agricultural Extension is receiving attention.

In-service Training for Lecturers.—The lecturing staff completed a twenty-hour course of instruction in Teaching Methods in 1962. There will be follow-up refresher lectures on specific aspects of teaching as the needs arise.

Students' Tours and Visits.—The annual instructional tours and visits to places of interest were conducted as usual.

Student Extra-curricular Activities.—The Students' Representative Council, the Sports Club, the Debating Society, the Camera Club, the Student Christian Movement and the College branch of the Agricultural Bureau continued to function and contributed to the welfare of the College and its social life.

The College was represented at the Australian Agricultural Colleges Intercollegiate Contests in Rifle Shooting and Tennis, held at Dookie Agricultural College, Victoria.

Short Course Schools and Conferences.—College facilities and, in some cases, staff were made available for the following short course schools and conferences: The Agricultural Bureau State Congress, Commonwealth Agricultural Extension Conference, Food Technology Diplomates Conference, Division of Horticulture Conference, Livestock Officers (Pigs) Conference, District Agronomists' Conference, Livestock Officers (Sheep and Wool) Seminar, Milking Machine Survey Officers' Conference, School for Dairy Factory Apprentices, School for Dairy Factory Operatives, Dairy Science School, School for Food Factory Foremen, School for Junior Farmers (Beef Cattle), Irrigation School for Representatives of Commerce, School for Dairy Farmers, Tractor Maintenance School, School in Apiculture, School for Department of Child Welfare Officers, Departmental Extension Methods School, and a School for Department of Technical Education Officers.

The School for Pig Farmers was cancelled due to the Swine Fever problem. The Annual Poultry Farmers' Field Day, normally held in May, was postponed on two occasions and will now be held on 14th September, 1963.

Student Enrolment Statistics.—At the commencement of 1963 there were 248 students: 189 pursuing the Agriculture Course, thirty-one the Dairy Technology course and twenty-eight the Food Technology Course.

Most students enter the College Diploma Course with a higher standard of education than the present minimum which is the Intermediate Certificate. The standard of entrants in 1963 compared with 1962 is as follows:—

Standard	Agriculture Per cent.		Dairy Technology Per cent.		Food Technology Per cent.	
	1962	1963	1962	1963	1962	1963
Leaving Certificate Pass	55	59	25	41	79	94
Leaving Certificate Failed ..	16	8	19	12	7	6
4th Year	11	16	6	18	nil	nil
Intermediate Certificate	18	17	50	29	14	nil
	100	100	100	100	100	100

Of 189 students in the Agriculture Course, 69 are the sons of farmers. Of the 82 students enrolled in the 1st Year of the course, 30 are sons of farmers.

Selection based on merit and experience now carries more weight in the enrolment procedure for the two Technology Courses.

National character of the training in both the Dairy and the Food Technology Courses is again emphasised by the admissions from other States and the employment of many Technology diplomates in other parts of the Commonwealth.



Extension Session at Hawkesbury College

During vacations the Agricultural College facilities are used for farmer schools and conventions. This was a pig carcass-appraisal session, on quality as affected by feeding.

Admissions to the Dairy Technology Course in 1963 comprised two from Victoria, one each from South Australia, Tasmania and Western Australia, and 12 from New South Wales.

Admissions to the Food Technology Course in 1963 comprised two from Victoria, one from Australian Capital Territory and 13 from New South Wales.

Diploma Results.—The diplomas awarded on the 1962 examinations comprised 52 Diplomas in Agriculture, 16 in Dairy Technology and nine in Food Technology. Two Class II Honours were awarded in Agriculture, two in Dairy Technology and one in Food Technology.

Diplomates' Vocations.—Of last year's 52 Agriculture diplomates, 23 are employed on farming and grazing properties, eight entered the State Department of Agriculture and five entered other governmental agencies, private firms accepted seven as technical representatives or in other capacities, four entered companies associated with agricultural and pastoral industries, one has gone overseas for further experience, one has entered the teaching profession, one has enrolled at the University of Sydney and two have entered other employment.

Thus, 36 Diplomates of the 1962 Agricultural class are either on the land or employed in governmental agencies. Most of those in the latter category plus the 11 employed by private firms are directly or indirectly applying their College training to the promotion of better agriculture.

The employment spread of the 361 Diplomates from the Dairy Technology Course since 1928 is as follows: N.S.W. 258, Victoria 44, South Australia 16, Tasmania 13, Queensland 14, Western Australia 9, Australian Capital Territory 2, outside Australia 5.

First diplomates of the Food Technology Course completed their course in 1952. The 69 diplomates up to 1962 are now employed thus: N.S.W. 42, Victoria 19, South Australia 3, Queensland 3, overseas 2.

Sectional Operations at Hawkesbury

FARM SECTION

Autumn Cropping.—Of the 465 acres sown to cereals, 100 were grazed and 30 were later stripped for grain which yielded 10 bushels per acre. Areas cut for silage ranged from 2½ to 4 ton per acre, yielding a total of 300 tons for the dairy cattle. Lighter yielding crop was cut for sheaf hay or baling and added about 30 tons of baled hay and 80 tons of sheaf hay to the fodder reserve.

Thirty acres of barley were used for student instruction in grain harvesting and yielded 12 bushels per acre.

The current season has been very adverse for cereal establishment. Only 30 acres of oats and 40 acres of barley have been seeded, and establishment was adversely affected by the extremely wet weather.

Cereal Rotation.—The present rotation is very narrow, with 400 acres seeded each year on an area of 900 acres because of stock numbers and the annual feed needs. A limited, further suitable area will be available after clearing but at present the fertility-depleting rotation could be widened only by reducing horse numbers or the amount of fodder required.

Fodder Reserves Position.—About 120 ton of cereal hay was used to feed horses and little over 18 months' supply is on hand. With no cereal hay harvest this season, the feed position could be adverse before the 1963-64 harvest. An immediate review of horse numbers has become imperative.

Some 238 tons of pasture—lucerne hay, including 53 tons of purchased lucerne hay, was added to the fodder reserve, whilst 120 tons was utilised by the Dairy and Sheep Sections. No hay was received from other Institutions. There is about 125 tons on hand at present.

At the close of the 12 months 200 tons of silage was on hand. During the year 350 tons was added to the reserve in the overhead silos whilst 300 tons was utilised by dairy stock. There is 250 tons on hand.

Some 88 tons of oaten grain was purchased. This, with 3 tons on hand, was used by the Horse and Cattle Sections.

Seventeen tons of feed wheat was received by transfer from other institutions and utilised by the Piggery and Poultry Sections, as against 67 tons of feed by transfer in the previous year.

Summer Crops.—The maize, sorghum and millet crops were good and allowed 330 tons to be ensiled in hillside-type ground pits as a reserve for drought feed.

Lucerne-growing remains a problem at the River Farm. A well-established stand is productive for only about 18 months. Correct methods, heavy seeding rates and the latest most suitable inoculum have not shown any better results.

Pastures Areas.—At the end of the previous year some 200 acres of good potential pasture existed, but the past season was adverse for regeneration of subclover-ryegrass pasture and now there is only about 100 acres of scattered white clover with limited ryegrass. This autumn has been too wet to establish pasture. Only 17 acres, in Dairy Section paddocks, were seeded.

Fencing.—Some 80 miles of fencing exists on the College and the cost and difficulty of obtaining split posts are increasing. Erection of treated, local round posts has been successful. An estimated outlay of £400 for equipment to treat and erect round fence posts would be recovered in four years by thus avoiding expenditures on split posts. The increase in cattle numbers has underlined the need of considerable replacement fencing and to dog-proof the boundary fencing.

Irrigation.—Water storage and irrigation from the turkey-nest dam again functioned satisfactorily. There was more than enough run-off to replace water used. The recommendation to increase the storage capacity of this dam has not been carried out; and the hillside dam has yet to be repaired. Underground mains to connect the two dams have been installed.

Success of the overall system depends on repair of the hillside dam and electrification of the pumping units. There has been no further development of proposed irrigation from College-Town sewage effluent.

Drainage.—The very wet autumn-winter emphasised the need for maintenance of existing dams and further drainage of the entire College area. A first step is to clean the main drains by contract.

Clearing.—Developmental clearing continued. A further 50 acres in Blacktown No. 6 neared completion. The Soil Conservation Service has completed plans for absorption banks and a waterway to be constructed before this area is cultivated.

Tractors and Machinery.—The "on loan" Hayliner 68 baler was returned to New Holland (Aust.) Pty. Ltd. and a model 69 baler was purchased. New Holland (Aust.) Pty. Ltd. made a flail forage chopper available for use. A John Deere 9-run sodseeder was purchased. A header was transferred from Trangie Agricultural Research Station.

The "on loan" Nuffield 4D.M. tractor was returned to British Motor Corporation. The "on loan" Fordson Major and Fordson Dexta tractors were replaced by Ford Motor Co. Ltd. with Fordson Super Major and Dexta petrol tractors. The John Deere-Lanz crawler tractor was returned to Waugh and Josephson Pty. Ltd.

AGRONOMY RESEARCH SECTION

District Work and Extension Activities.—Weed control and vegetable trials were carried out on farms in this district. Weed control and plant nutrition trials were established also in other districts by College agronomists.

Information and advice were given to farmers by telephone, letter and personal contact. The enquiries ranged widely but were mostly on plant nutrition, weed control and vegetables.

The research agronomists also gave some lectures and demonstrations to College students, mainly about the various research projects.

Co-operative Research Systems.—Co-operative research was done with the Universities of New South Wales, and Sydney, the C.S.I.R.O. Divisions of Food Preservation and Plant Industry, the Australian Atomic Energy Commission, other Divisions of the Department of Agriculture, and commercial firms and private individuals.

For co-operative weeds research the Geiogy Agricultural Chemicals firm has an experimentalist and a field assistant located at the College. The system is effective.

Pasture Investigations.—Agrostology work at the College continued on a restricted scale. The main programme has been to evaluate the potential of improved, irrigated pastures for fat lamb production. But work is also proceeding on the problem of lucerne persistence; the evaluation of Rhodes grass strains and a miscellaneous collection of introductions for pasture species improvement; and continued testing of commercially available species in rows and swards in the observation nursery.

From the sheep grazing trial concerned with pasture management and utilization it is apparent that optimum carrying capacity of the College's improved pastures is 12 ewes per irrigated acre. All feed was utilised at that rate and there was good lamb turn-off. Higher stocking rates, up to 15 ewes per acre, for the most part proved too high, because feed was often in short supply, whilst lower stocking rates caused a feed surplus in each year of the trial. The next stage of the trial, on a slightly altered basis, will commence in September, 1963, with a new flock of sheep.

Lack of persistence in lucerne stands has been a problem in this district for years. Previous investigations have shown that the problem could be reduced by use of lime or nitrogen fertilizers but not economically. Nutrition trials were therefore established in the field and glasshouse, and these continued in the past year. Some of this work was in co-operation with the C.S.I.R.O. Treatments involving the sowing of lucerne in spaced rows showed positive results. In the first trial of this nature there was marked better growth from rows than from swards, but floods washed out the trial. A further trial, sown in the past year, has not shown marked difference between rows and swards. Die-out has occurred in each, although less in the rows. The trial is being continued.

In pasture species work some introductions are being tested alongside the more important commercial pasture varieties in the observation nursery; but the main species work has comprised a trial wherein 26 Rhodes Grass introductions are being compared. These came from different altitudes in equatorial Africa. The aim is to determine their yield differences in New South Wales coastal conditions. Only one sampling cut has been made as yet.

Vegetable Investigations.—Many vegetable introductions from overseas were tested during the year, but the main vegetable investigation programme comprised tomato, bean, pea and capsicum breeding. The report of the Division of Plant Industry includes reference to the outcome of the breeding programme.

Plant Nutrition Investigations.—Glasshouse work in the 1962 season was mainly of routine and follow-up character. Areas from which the trial soils were taken were as follow: Maitland, four trials; Glen Innes, three trials; Albury, nine trials; Coonabarabran, five trials; Cootamundra, eight trials; Mudgee, twenty-one trials; Inverell, twenty-one trials; Taree, two trials; Tumut, two trials; mid-Hawkesbury, three trials; Bathurst and Gundagai, one trial each.

Some of the findings of economic worth were: development of zinc deficiencies in Cootamundra and Albury subsoils with continued addition of superphosphate; scattered occurrence of boron deficiencies in granitic, miscellaneous soils from Maitland and Mudgee; continued molybdenum deficiency in soils cropped for long periods; sulphur deficiency in an area subject to flooding; and a finding that certain black sands on the coast do not need such heavy dressings of lime as previously supposed.

Field Crop Investigations.—The field crop research programme was mainly concerned with maize, sorghum and oats.

Maize trials with early, mid-season and late maturing hybrids were sown to compare hybrids within each of these groups and to test their suitability for this district. Male-sterile maize lines and fertility-restored hybrids were tested again for the Grafton Experiment Farm maize breeder.

Sorghum trials involving varietal and spacing treatments were washed out by heavy rains. Some foundation seed of Saccaline Sweet Sorghum was produced.

The coastal Oat Uniform Yield Nursery was continued. Twenty varieties were tested.

Variety trials were conducted for lupins, rape, kale, fodder millet and various summer legumes.

Thirty-three rice introductions from overseas were grown under quarantine, potentially for subsequent use in the Department's rice breeding programme.

Weed Control Investigations.—Weed control research trials were again undertaken. Some were at the College, in the field and in glasshouses, and some were in this and other districts. The trials concerned weed control in vegetables, flowers, field crops and pastures, and there were also soil sterilant investigations.

Potatoes, french beans, cabbages, cauliflowers, carrots and asparagus were the main vegetable crops dealt with in trials of the effectiveness of a wide range of weed control chemicals. These and earlier trials have made it possible to give recommendations for economic control of weeds with various selective herbicides. Many of the recommendations are now in practice.

Similarly with commercially-important flower varieties, including gladioli, daffodils, cineraria and cornflowers, the results of trials have made effective chemical weed control recommendations available.

The field crops on which weed control trials were undertaken included maize, wheat, sweet sorghum and broom millet. The wheat work was only of preliminary nature. Trials in the other crops have led to results now available for farm use. Recommendations for use of herbicides in maize, in particular, are now being followed with good results in commercial maize areas.

Trials of chemicals for weed destruction in pastures were less extensive than those in other crops. Some chemicals were tested for weed control in lucerne and chou moellier.

Bio-assay trials of persistence of various herbicides in the soil were done in the glasshouse. These were designed to determine rate of breakdown of each chemical in the topsoil, effectiveness of the chemical as a herbicide for various periods after application, and penetration into the subsoil. Soils to which herbicides had in the past been applied were collected from throughout the State, and soil samples were also taken from College field trials sprayed for these investigations.

Soil sterilant chemicals developed to kill existing weed growth and sterilise the soil to prevent further growth also were tested. Some of these herbicides proved very effective for application to drains, irrigation ditches, road sides and industrial sites.

ORCHARD SECTION

Investigations.—Fruits from Persimmon varieties were recorded but no other data, on blossoming and fruitfulness, were obtained this year. Seedling stocks were lost through damping-off. Further supplies of stocks have been raised to propagate selected Persimmon varieties.

Results from the Washington Navel Rootstock Trial were recorded in detail. Quality factors such as percentage juice, acidity and total solids were tested. Average yield per tree and the percentages of different size grades of fruit from each stock/scion combination were recorded.

Assistance was given in the investigations concerning area Fruit Fly control in the Richmond and Windsor districts (see Entomology Branch report, Division of Science Services).

Development and Reconstruction.—Tree planting and the removal of older groups proceeded according to plan, designed to provide constant renewal of orchard sections. Peach, plum, apple, pear and citrus trees were planted in new unit sections.

Old grape vines, planted in 1927 and growing on stakes, were removed from D block and some pear trees were removed from B block.

Old Valencia trees in A block successfully renovated by "skeleton pruning" and other suitable treatments yielded four bushels per tree in 1962. This was three years after treatment.

Existing underground tile drains were cleaned out; 2-inch laterals were replaced by 4-inch tiles in adjoining areas of A-B blocks; and new concrete inspection sumps were installed along the drain.

A new spray irrigation plant has been obtained to facilitate supplementary irrigation.

Educational.—Plantings of new trees each year have already made available a better population of trees of all ages for instructional work. More comprehensive demonstrations, and better teaching through greater student participation, have been achieved.

Production has also increased and now provides more fruit for class work in harvesting and handling.

New machinery and plant has helped to maintain the desired standard of instruction.

Extension Service.—Some extension work has been done in the Richmond-Windsor area; mainly advice on specified problems, rather than routine extension visits. Many growers have visited the College orchard or contacted officers at the orchard for information.

Fruit Supplies.—Fresh fruits were supplied for College domestic needs throughout the year and some fruit was supplied to the College Cannery.

VETERINARY SECTION

Routine Testing and Vaccination.—These were continued to maintain the various herds and flocks within the Brucellosis-free, Tuberculosis-free and Pullorum-free flock schemes.

Quarantine Measures.—These were maintained for the pigery to prevent entry of Swine Fever.

HORSE SECTION

At 30th June, 1963, horses numbered 71 head, comprising 34 Arabs, nine draughts, 20 hacks, four coach horses and four crossbred Arab foals.

During the period, one draught died, one hack was transferred, one Arab colt died and three Arab colts were sold. Natural increase was nine foals giving a total of 71 head of horses at present.

The stated policy of sale of horses as yearlings is now being carried out.

SHEEP SECTION

Management Factors.—Grazing conditions were poor due to heavy and consistent rain. Early lambs were nicely finished but later lambs were marketed at low weights and in rough condition. Feed prospects for ewes about to lamb are the worst for years, and it has been necessary to use areas not fenced for sheep and to maintain a 24-hour shepherd. Grazing oats again proved invaluable, even though the conditions caused a very poor crop.

Fence Shortcomings.—Fencing remains the biggest single problem in running sheep at the College, and needs major attention to permit adequate management of stock, pastures, crops.

Lambing, 1962.—Lambing commenced early in July and weather conditions were mostly satisfactory. Difficult births were numerous, pre-disposed by several dog attacks just prior to lambing.

Mating, 1963.—A group of 100 commercial ewes was mated early in January, a month earlier than normal, to study the June lambing utilisation of irrigated pasture. This earlier lambing should have lambs on the market in September, before late spring rains cause trouble and whilst the price is still relatively high.

The main commercial group was mated in mid-February as usual. Stocking-rate trial ewes were not mated until early March; these ewes are hogget replacements and would not breed earlier.

The first group of merino ewes in the College flock was mated mid-April, later than desired.

Experimental Work.—(1) *Production per Acre Experiment:* The old flock in this trial has been replaced by purchase of 150 crossbred hogget ewes. Design of the trial has been varied to allow comparison of two equal stocking-rates, under short and long paddock-rotations, to determine the effect on internal parasite control.

(2) *Wool Growth and Body Condition of Wethers Fed Silage at Varied Levels:* Local floodings delayed this trial but silage pen-feeding is proceeding, to accustom the wethers to this feed before the various levels of feeding commence.

(3) *Merino Selection Efficiency:* The first group of 80 ewes has been received for the commencement of the Merino breeding flock for this line of study. The flock will be bred in two sections: a *Random Group* wherein no selection will be exercised, and a *Maximum Selection Group* wherein selection will

be based on fleece weight, fertility, and other relevant. Full records will be kept to measure the effect of face cover on fertility, birth weight, growth rate, etc. Whilst this project is to be a practical selection demonstration to students the keeping of complete records of all measurements, the flock will yield also a research value.

Flock Statistics.—At 30th June, 1963, the College flocks totalled 924 sheep; including 303 Commercial Flock ewes, 150 Experimental Flock ewes, 80 Merino ewes, 157 rams, and 234 sheep for rations and miscellaneous demonstration purposes.

The 1962-63 shearing yielded 29 bales totalling 9,142 lb. greasy wool. Besides wool, sales included 376 sheep skins, 458 crossbred lambs and 132 sheep.

Transfers and purchases comprised 758 sheep received from other Farms, 59 transferred to other Farms, six rams purchased, 230 sheep purchased, eight rams donated, and 691 sheep supplied to the kitchen for rations.

Dogs took heavy toll of sheep, directly through wounds and indirectly through loss of condition and lambing problems caused by frequent disturbance; 73 sheep were killed or had to be destroyed, and 70 required injury treatment, as a result of dog attacks.

From 467 ewes mated in all flocks, experimental and commercial, the lambs-marked percentage was 112.7, as against 98.6 per cent from 678 ewes mated in the previous year.

DAIRY CATTLE SECTION

Friesian Cattle at Shows.—The 20 Friesians exhibited by the College at the 1963 Sydney Royal Show were "Most Successful Exhibitors" in the Friesian Section for the second successive year. The females gained three Firsts, six Seconds, five Thirds and four Fourths. Of the males, "Hawkesbury Prince Regent", son of the imported Canadian Bull "Sniders Fond Hope King", gained Reserve Senior Champion Bull. In the two preceding years he had gained the Senior Champion award.

A team of ten was exhibited at the 1963 Hawkesbury District Show. The females gained Champion Cow ("Hawkesbury Fond Colleen"), five Firsts, two Seconds and two Thirds. The bull "Hawkesbury Royal Master" sired by "H. Prince Regent" was awarded Reserve Champion Bull. A young bull "H. Countess Voyageur" gained Reserve Junior Champion Bull.

Friesian Stud Statistics.—At 30th June, 1963, the stud totalled 164 head, including 16 adult bulls, five loan bulls, 49 cows in milk, 13 cows dry, 28 heifers, and 53 calves under 12 months old. A year earlier the stud totalled 140 head.

Births for the year totalled 71, comprising 35 males and 36 females; compared with 63 for the previous year, comprising 40 males and 23 females.

Friesian Stud Sales.—Eleven Friesian males were sold, for 1,133 guineas, and two females for 500 guineas, a total of 1,633 guineas; compared with 1,813 guineas for 16 males and 7 females in the previous year.

Ten young bulls are now on offer to prospective buyers in an extensive waiting list.

Friesian Breeding Programme.—An analysis has shown that excluding the sires of purchased cows and foundation stock, the females in the Stud have been sired by no less than 16 bulls. Artificial insemination has been mainly the means. Semen from "Frazea Lord Jewel" has been used extensively, and that of "Sniders Fond Hope King" when possible. "Frazea Lord Jewel" is stationed at Aberdeen A.I. Centre and "Sniders Fond Hope King" at Berry A.I. Centre. Each of these bulls, imported from Canada, was sired by "Spring Farm Fond Hope".

"Hawkesbury Bonnie Voyageur 2nd", a son of "Frazea Lord Jewel", is also stationed at Berry A.I. Centre, and has been used to some extent on the College Friesian Stud.

Production Figures.—The latest available official Herd Recording results are for the year ended 30th June, 1962, and show that 57 cows averaged 11,423 lb. milk, 438 lb. butterfat, with a 3.8 per cent test. For the preceding 12 months, 1960-61, 51 cows averaged 12,110 lb. milk, 435 lb. butterfat, with a 3.6 per cent test.

Milk and butter production of the various age groups in the 1961-62 twelve months, the latest official figures available, are tabulated as follow:—

Age	No. Cows in Age Group	Average Milk	Average B/Fat	Average Test
Two Year Olds	13	(lb.) 9,060	(lb.) 353	Per cent. 3.9
Three Year Olds	8	10,350	399	3.9
Four-Nine Year Olds	30	12,732	484	3.8

Trials and Experiments.—These include: Growth and Development Studies of Friesian Calves; Solids-not-Fat Study in the Friesian Herd; a Staphylococcus Toxoid Vaccination Trial; and an Identical Twin Heifer Trial.

BEEF CATTLE SECTION

Poll Hereford Stud.—This now totals 82 head, comprising 70 females, five adult bulls, and seven bulls under 12 months.

One of the foundation sires, "Pylara Taurus", is still on loan to the N.S.W. Milk Board and at Berry A.I. Centre. Two herd sires are in use, "Pylara Jock" and "Dananbilla Hector 2nd". Progeny of the former are showing very promising weight gains.

Stud sales realised 220 guineas for two Hereford bulls.

Commercial Herd.—The nucleus of this was purchased in 1961 as 42 horned Hereford weaners and the herd now totals sixty-seven. Culls have been allocated as ration beef.

Ration Cattle.—There were 32 head at 30th June, 1963. During the 12 months 101 were killed for rations and 50 were received from other Farms and herds, including culls from the College Friesian and Poll Hereford herds.

POULTRY SECTION

Breeding.—Poultry and turkey breeding were carried out but, with labour shortage, not as extensively as in previous years.

Egg Laying Competition.—The sixty-first (and final) Egg Laying Competition and the first Egg to Layer Competition finished on 23rd March, 1963. A full report has been published. The second Egg to Layer Test commenced on 1st April, 1963. It is now the only type.

Random Sample Laying Test.—The tenth Random Sample Laying Test ended in November, 1962; 462 days from the hatching date of each sample. A full report has been published. The eleventh Random Sample Laying Test began in August, 1962.

Random Sample Broiler Test.—The Australian Random Sample Broiler Test ended on 2nd August, 1962. A full report has been published.

The third Random Sample Broiler Test commenced with the setting of eggs in January, 1963, and ended on 11th April, 1963. A full report has been published. The fourth Random Sample Broiler Test commenced with the setting of eggs in May, 1963, and will end in August, 1963. It includes a Victorian entry.

PIGGERY SECTION

The piggery is still operating under the protective quarantine restrictions imposed last year to prevent entry of Swine Fever. The Pig Raisers School was again cancelled, to meet the quarantine needs.

Herd Statistics.—Fifty-six litters were farrowed, and the stock total was 166 at 30th June, 1963. Some young gilts were introduced.

The present breeding stock totals 41 head, including two Tamworth boars and seven sows, two Berkshire boars and nine sows, two Large White boars and 11 sows, and two Landrace boars and six sows.

Sales, Stud and Market.—Stud sale enquiries over most of the year were not heavy, due to persistence of Swine Fever in the industry though not at the College. In latter months the demand increased and could not be fully met with the stock on hand. Stud sales comprised 17 head for £473, and market sales were 196 for £1,612.

Student Demonstrations.—Progress of the protein demonstration was displayed in graph and chart form and all classes were abreast of developments. Effect of temperature on efficiency of feed utilisation and growth rate under varying systems of housing is a current demonstration, using the totally enclosed house, the deep litter type shed and the open fronted shed with yard. Typical methods of utilising separated milk is another current demonstration.

APIARY SECTION

Statistics.—Abnormally high rainfall and associated conditions in recent months adversely affected colony strength, and the total of hives was further reduced. At 30th June, 1963, there were 56 productive hives, compared with 60 in 1961-62, 90 in 1960-61, and 96 in 1959-60; and 10 nucleus hives, compared with 15 in 1961-62, 40 in 1960-61 and 30 in 1959-60.

Yield of honey was only 420 lb., taken in January for an extraction demonstration at the Summer School. Most was fed back to the bees later to provided winter stores.

Queen Bee Dispersals.—Demand for College-bred queen bees increased. Over 200 were supplied to beekeepers throughout the State.

Instruction.—A course of instruction in Apiculture was given to Agriculture I students in accordance with the College curriculum.

Summer School in Apiculture.—This annual was held 2nd-11th January, 1963.

SCHOOL OF DAIRY TECHNOLOGY

General.—Intakes of milk and cream were high compared with most years and provided good training for students in all sections of the treatment and manufacture of dairy products.

Special Schools.—Twenty-seven factory apprentices attended in May a two weeks' special school. In the same period a one week school in milk and cream grading was held for factory operatives.

Training for Colombo Plan Fellows.—Two engineers from the Philippines are undergoing 10 weeks' special training in dairy engineering at the School of Dairy Technology.

Quality Cheese.—The College received the "Most Successful Cheese Exhibitor" award at the Sydney Royal Show, 1963. Cheese sales have increased, especially 2½ lb. blocks in vacuum packs.

Factory Production Statistics.—In 1962-63 the Factory produced: 306,799 lb. butter (263,268 lb. in prev. year); 146,657 lb. cheddar cheese (121,244 lb. in prev. year) and 1,391 lb. fancy cheeses (870); 2,066 gals. ice cream (2,202 gals.); 102,036 lb. dried milk (57,524 lb.); 117 gals. condensed milk (71 gals.); 3,578 cartons (½ pt.) flavoured milk (86,960 cartons); 175 gals. cream mix (169 gals.) and handled from various sources more than 6 million gals. of milk (5 million).

DAIRY RESEARCH

Bitterness in Cheese.—Results of this project will soon be available.

Salt Types in Butter Manufacture.—A progress report of results from use of various qualities of salt in butter manufacture has been made.

Blue-Veined Cheese.—Research this year comprised manufacturing trials and associated work on pH changes in the milk, whey and final cheese. The main aim was satisfactory mould growth in cheese made from pasteurised (H.T.S.T.) homogenised milk.

Hydrogen peroxide as a substitute for pasteurisation did not produce a satisfactory cheese, nor did addition of iron salts to the milk, nor wheying-off at low acidities.

It was established that a fairly high acidity (about .24 per cent) must be developed in the whey before hooping. Open texture, necessary for mould growth, appears to be promoted by washing this high acid curd prior to hooping. Mixing salt (1 per cent) in the curd prior to hooping is another necessary procedure. Delaying the start of mass (surface) salting until six days after manufacture also yielded good results.

Rapid Methods to Determine Composition of Milk.—**Total Solids:** Preliminary investigations of a technique using a thermostatically controlled hot plate and milk or cream bottle caps as drying dishes, showed that with 44 mm. cream caps, drying at about 135° C. could be completed in near to 10 minutes. Another hot-plate is being designed to ensure more uniform heating. **Protein:** The ultraviolet fluorescent technique for determining proteins in milk was studied. Good relationship was found between this method and the standard, Kjeldahl technique. A more intensive study is proposed.

Milking Machine and Mastitis Relationships.—A field survey was completed involving measurements of vacuum stability in milking machines, cowshed management conditions and milking routine, California mastitis test data and Ruakura milking machine performance tests, with a view to relating each of these. The results are now being analysed.

A new instrument to record vacuum changes in milking machines has been developed and tested and a prototype has been built at Hawkesbury Agricultural College.

The preliminary period of recording for two controlled trials studying the effect of vacuum stability on mastitis has been completed. One trial is at Glenfield Veterinary Research Station and the other at the Dairy Research Foundation, Camden.

The "cowshed management" project has yielded sufficient results to allow development of a practical ready reckoner for advice to farmers on type and size of cowshed for a particular herd.

Efficiency of Detergents and Sanitisers.—This is the overall subject of a project financed by the Australian Dairy Produce Board and for which a detergent research officer has been appointed.

"Efficiency" is measured on three criteria: milk stone deposit, corrosion, and sanitisation. Sub-projects established since the appointment was made in April, 1963, are as follows:—

- (i) Continuation of accelerated detergent trials previously in hand at the College. To date 20 have been done.
- (ii) Factory cleaning tests of the relative merits of foam-cleaning versus standard alkali, based on corrosion, deposit, bacteriological sampling and relative costs.
- (iii) Two experiments on milking machines, using standard alkaline and chlorine-cleaning and sanitising projects versus foam-cleaning.
- (iv) Preliminary work on chlorine-releasing detergent sanitisers. Original formulae have been modified as a result.
- (v) Comparisons of different materials used in milking machine components, simultaneous with the detergent trials. In particular the use of tin nickel alloy coatings on copper and brass and the use of plastics are under attention.

FOOD TECHNOLOGY SECTION

Winter School for Factory Foremen.—In conjunction with the N.S.W. Food Technology Association, a fourth school was successfully conducted. Forty representatives from industry attended, from four States. Thirty-one firms in diverse sections of the food processing industry were represented.

Equipment from Industry.—This included a peach pitter and a new temperature, pressure and time controller for the Retort. The value of these pieces of equipment exceeded £1,000.

Production Statistics.—The basic aim of the practical cannery operations is education, not production, but the Cannery has provided for the College kitchen most of the preserved fruits and vegetables needed there and many other items such as the basic ingredients of soups, etc., are provided.

Production has been relatively low this year for various reasons. Fruit supplies were insufficient and unreliable. The refrigerator compressor servicing the bacon factory cool storage room broke down and proved to be unserviceable. Thus it was impossible to cool-store significant quantities of fruit or to carry out the normal meat technology programme. Vegetable supplies also were low and unreliable as a result of the very wet period.

Even so, the factory processed 3,250 x 30 lb. cans of vegetables, 3,600 lb. quick-frozen vegetables, 1,570 x 30 lb. cans of fruit, 2,460 lb. jam, 12,940 lb. fruit pulp 1,250 x 30 lb. cans fruit juices, 260 x 30 lb. cans soup, 3,600 quick-frozen fowls, and a wide range of condiments and miscellaneous products including spaghetti, custard powder, jelly crystals, crystallized fruit, brined vegetables, etc.

WAGGA AGRICULTURAL COLLEGE

General

Staff Changes.—Mr. J. R. Sutherland, Lecturer in Biology, was appointed to the position of Deputy Principal in August, 1962.

Mr. B. F. Atkins, Lecturer in Chemistry, was appointed Deputy Principal, Hawkesbury Agricultural College, in March, 1963.

The newly created position of Supervisor of Student Training has been circularised. Efforts are being made locally to obtain the services of a part-time Matron. The position of Housemaster has been deleted.

Staff Courses.—Following recommendations by the Agricultural Colleges Advisory Committee, arrangements were made with the Wagga Teachers' College to conduct a series of evening lectures and discussion periods with the College lecturing staff. A panel of five Teachers' College lecturers including the Principal and Deputy Principal, conducted ten such two hour evening periods between July and October, 1962. A further lecture-discussion period on specific topics was conducted by the Principal, Wagga Teachers' College in June, 1963.

Student Enrolment.—In its 15th year, the College commenced curricular activity with a total of 109 students, 12 more than the 1962 record.

The following table compares student distribution between the three years in 1962 with those of the previous five years:—

Student Year	1958	1959	1960	1961	1962	1963
First Year	37	34	35	32	39	44
Second Year	32	31	31	34	31	37
Third Year	25	29	30	30	27	28
Totals	94	94	96	96	97	109
Percentage of Assisted Students	30.9	34.0	28.1	27.6	23.7	25.5

The 1963 intake of 49 new students included five admitted to Second Year. Of the 44 First Year students, 39 had qualifications in excess of the minimum. Twenty-nine have the Secondary School Leaving Certificate. The 11 per cent of admissions with only minimum qualifications is the lowest recorded to date and contrasts most favourably with 38.8 per cent in 1962.

Student Numbers.—To maintain a balance of numbers in each year and to enable the western accommodation block to be renovated, student numbers were limited to 109 in 1963. It was the highest number recorded since the foundation of the College but is expected to rise to 120 in 1964 and to the maximum of 134 in 1965.

Diploma Examinations, 1962.—All 28 Third Year students in 1962 gained their Diplomas, one with First Class and two with Second Class Honours.

Ex-student Diplomat Numbers.—The total of Wagga diplomates is now 260. Fourteen others commenced the Diploma course at this College but gained the Diploma at other Agricultural Colleges, thirteen at Hawkesbury and one in Queensland.

Statistics of Ex-students' Occupations.—At 30th June, 1963, there were 377 ex-students (excluding those who were in residence for less than one session). They were occupied as

follows, with about 80 per cent applying their vocational training to rural and allied pursuits for which the curriculum was designed:—

(1) Following agriculture—		
(a) On farms	168	
(b) In Government Departments or quasi-governmental Authorities—		
Agriculture	45	
Soil Conservation	9	
Education	3	
A.B.C.	2	
Valuer General's	6	
Other	18	83
(c) In Commercial firms	38	289
(2) Undergoing further training	10	
(3) Left agriculture	31	
(4) Occupation unknown	44	
(5) Deceased	3	
		377

Curriculum Amendments.—Arising from a meeting of the Curriculum Sub-Committee of the Agricultural Colleges' Advisory Committee some major changes were recommended. The following have been implemented in 1963:—

- "An increase in basic science, particularly biology" in First Year: In the First Year curriculum now being followed basic science absorbs 48 per cent of the lecture time. Basic biology has been expanded, particularly zoology and animal anatomy, and physiology has been taken from Second Year into First Year. The farm mechanics course has been discontinued and an appropriate physics course has been integrated with the chemistry course. Courses in various elements of agriculture absorb 28 per cent of lecture time, technical trades absorb 19 per cent and English expression 5 per cent. The old course in business principles has been discontinued.
- "More basic Farm Management studies at the expense of conventional Economics and detailed Bookkeeping practices": The present Second Year students are following the old bookkeeping course. Subsequent Second and Third Year students will undertake a course in farm management combining aspects of business principles, bookkeeping and economics. The current farm management course for Third Year includes whole-farm management studies as projects on private farms.
- "Deletion of Stage II Woolclassing from ordinary curriculum time": This has been effected, and Stage II Woolclassing is being studied in 1963 as an evening elective by about half the class.

In addition, surveying and building construction has been transferred from Second to Third Year. Animal genetics and nutrition has been moved from Third to Second Year.

Other than the above implementations and changes, the Second and Third Year students in 1963 are following the old curriculum, as will the 1964 Third Year students.

External, Lecturing Aid.—As in previous years the Wagga Technical College assisted with lectures and demonstrations in bookkeeping, farm engineering, tractor maintenance, woodwork, metalwork and woolclassing.

Staff of the Southern Regional Office of the Department, Wagga, provided instruction in farm management to senior Years and in apiculture to First Year in 1962. Apiculture has been transferred from First Year to Third Year where it will be an elective in 1965 et. seq.

Students' Extra-curricular Activities.—The College competed with some success in the Annual Australian Agricultural Colleges Sports Contests at Dookie, Victoria.

All new students participated in the Annual First Aid course and examination conducted by officers of the Wagga Wagga District Ambulance Service.

Junior students were presented with a series of advisory talks on careers by senior officers of the Regional Office of the Department of Agriculture, the Soil Conservation Service, the Wagga Wagga Teachers' College, the Valuer General's Department and the Junior Farmer Movement.

Officers from the Agricultural Research Institute, the Department's Regional Office and College lectures co-operated in conducting student group seminars.

Agricultural Research Institute officers provided a series of lectures on current research projects.

Debating activities were again successful. They included the Inter-year debating contest and debates against College staff and the Wagga Wagga Teachers' College.

Short-Term Schools.—The 12th Annual Junior Farmers School in wheat and sheep husbandry early in September, 1962, was attended by 16 young farmers. Also in the August-September vacation, 56 Second Year Sydney University students received two weeks tuition in animal husbandry and farm machinery. A poultry farmers school organised by the Southern Region of the Department of Agriculture was attended by 20 persons.

Student Tours.—Third Year students made three-day visits to the M.I.A. in October, 1962, and February, 1963, and spent five days on the southern and central tablelands during September, 1962. Second Year students made their annual four-day tour of the Gundagai-Tumut-Batlow-Tumbarumba region in November, 1962.

Senior students gained experience from stock attendant duties and in judging competitions at the Sydney Royal Show, Wagga Show, Wagga Ram Show and Sales, Albury Sheep Show, and Wagga Angus Breeders Show and Sales.

Half-day or one-day visits were made to studs, properties on farm management surveys, Cootamundra Bacon Factory, Junee depot of the Egg Board, Wagga Soil Conservation Station and Wagga Abattoir.

The Three Term Year.—Reactions to the three-term year introduced at the beginning of 1962 have generally been favourable. It has helped to integrate appropriate courses of the Wagga Technical College, and has also allowed more useful practical experience away from the College during the autumn and spring vacations than was possible in the former mid-winter vacations.

Works and Improvements

Student Accommodation.—Completion of the accommodation section of a new 64 room block enabled it to be occupied in February, 1963. Preparation of paths, steps, access road and cribbing for the sharply sloping surrounds, lawns and general landscaping of the area are proceeding.

The old western block has been completely rewired and power outlets provided in each room. Bathroom/toilet facilities have been improved by completion of a modern annexe on both the ground and first floors.

Water Supply.—Filtered water supply has been doubled and provision made for the College and the Agricultural Research Institute expansion by additional mains and a larger pump capable of a peak daily output of 177,000 gallons. Unfiltered water supply has been extended an additional 60 chains to the western section of the College farm, mainly for Institute grazing trials. Improved stock water supply was effected by enlarging an existing dam and the sinking of a new dam.

Electricity Improvements.—Reticulation aerials were renewed and a number of serious defects remedied at a total cost of some £4,000. Mains had been overloaded because of the new accommodation block and expansion of farm and livestock sections.

Other work included illumination of the students' basketball court, installation of street lighting in areas surrounding the administration and accommodation blocks, partial illumination of the sports oval, and installation of overhead space heaters in three lecture rooms.

Irrigation Installation Project.—The first stage in establishment of an irrigation area project was completed in late 1962 by construction of a 6,500,000 gallon ring tank. Laying the water supply line from the Murrumbidgee River to the tank has commenced. Water for irrigation of 150 acres will be available early in 1964. Tenders have been called for preparation of land for flood irrigation.

When completed the project will help to avoid seasonal shortages of fodder and also will be an asset to student instruction.

Roads.—About $\frac{1}{4}$ mile of College drive was resealed and $\frac{1}{2}$ mile of internal roads formed and gravelled. Approximately 500 yards of roadway was kerbed and guttered.

Fencing.—Two miles of old boundary fencing was replaced and a mile of new sub-division fencing was erected. The Piggery Section has been completely re-fenced except for two yards.

Farm and Sectional Buildings.—The various constructions included a new Mechanic's Workshop, an instruction workshop for farm engineering, a start on construction of a Random Sample Test Shed in the poultry section, in part from the Australian Turkey Federation, new show preparation stalls in the dairy section, a six stall stable with feed and harness rooms to enable the stud horse section to move from its present site and permit the dairy section to extend eastward, a glasshouse to raise potted plants and shrubs for general landscaping, a start on conversion of the old weatherboard accommodation block to provide a central store and stores office, removal of the woolclassing hut to the sheep section and its renovation to include overhead space heaters and fluorescent lighting.

Extensions to the administrative Graham Block were commenced in May, 1963, to provide more office space and for installation of an automatic telephone exchange to serve both the College and the Research Institute.

Swimming Pool Project.—Tenders have been let for installation of the filtration plant. Tenders have not yet been called for the pool itself. Approximately £25,000 is now available to finance the project, including £9,000 raised by local effort and subsequent investments.

Sectional Operations at Wagga College

College Farm.—The season favoured production of high yielding cereal crops, and the College wheat crop was the best ever grown at this farm. From 170 acres of wheat, 6,612 bushels of grain were produced for an average of 38.8 bushels per acre. From 73 acres of oats the yield was 3,044 bushels for an average of 41.7 per acre, and 21 acres of oats yielded 909 bushels for an average of 43.2 per acre. In addition over 100 tons of cereal hay and 230 tons of silage were harvested and 4,000 bales of pasture and lucerne hay conserved.

The area of improved pasture available to College livestock was reduced as the Agricultural Research Institute took over 100 acres for trial purposes.

The Farm co-operated with Division of Plant Industry in production of foundation seed barley and wheat, and in barley variety trials.

Areas of College pasture in 1962 and 1963 were used by Entomological Branch, Division of Science Services, for insecticidal trials for control of red-legged earth mite.

The Farm also co-operated with the Agricultural Research Institute and the C.S.I.R.O. in making available land, equipment and fencing for various trials and experiments.

Apiary Section.—The new honey house has been fully equipped. A start has been made to build up sufficient hives for student instruction and to provide honey for ration purposes.

Dairy Section.—Herd production was similar to that of 1961-62. The two imported bulls "The Mounts Orange Boy" and "Groombridge Triumph" continued to influence the herd results. There have been very creditable performances by their daughters despite the unfavourable autumn and early winter. "Wagga Winsome Jessica", a four year old daughter of "The Mounts Orange Boy" (Imp.), topped the herd with a yield of 614 lb. butterfat and 11,340 lb. milk in 300 days.

Natural increase in the herd was 35 males and 26 females including three still-born calves. Three females and one male were by artificial insemination. The herd number was 140 at the 30th June, 1963.

Nineteen stud males and thirteen females were sold for £1,675. Culls to the commercial herd included 18 females. Six head died from natural causes, scours, bloat and milk fever. Demand for stud stock continued to exceed supply. Enquiries for high quality stock by "The Mounts Orange Boy" increased.

Three bulls were loaned to the veterinary Physiology Department, Sydney University, during the year, for the study of artificial insemination techniques.

Vibriosis continues to be a serious hazard in the breeding programme and there has been a marked decline in the fertility of the herd.

Sales of milk and cream to staff and of cream to the Murrumbidgee Dairy Co. returned £3,500.

College Jerseys exhibited at the 1962 Wagga Show gained the following major awards: Champion Bull; Champion and Reserve Champion Cow; All breeds Type and Production Cow; All breeds Best Group (three females).

Nine animals exhibited at the 1963 Sydney Royal Show gained two Firsts, three Seconds and one Fourth prize, and one of the cows was selected to represent the Jersey breed in a pen of five cows in the inter-breed competition won by the Jersey group.

Sheep Section.—Stock numbers have remained reasonably constant for the year at between 2,000 and 2,200.

Purchases included two Dorset Horn Rams for the stud, from Alleynside and Broughton Brook, also four Corriedale ("Yarrowah") and four Romney Marsh ("Kimo") Rams.

The Section co-operated with the C.S.I.R.O. in a positive species and stocking rate experiment and with the Agricultural Research Institute in a new experiment involving stocking rate, fertilizer application and positive production.

Investigations continued into the problem of low production in Dorset Horn flocks. Suspect Clover Disease investigations continued.

Fair success was gained by College sheep exhibited at Wagga Show: two Firsts; three Seconds and a Third from the eight entries.

Poultry Section.—Egg production was maintained at a satisfactory level throughout the year, particularly in laying cages.

Orchard Section.—It was a poor season for fruit, overall. Early spring conditions were adequate for good fruit sets of pome and stone trees. Subsequent dry weather until late December caused poor setting of olives, poor filling out of most fruits and quite heavy preharvest drop in others.

Of the trials conducted up to 1962, only the Plum Stock Trial remains. The others have been discontinued or transferred to other establishments.

Beef Cattle Section.—The herd at 30th June, 1963, totalled 69, as against 93 at 30th June, 1962, and included 59 stud stock as against 78 at 30th June, 1962. The stud animals comprised nine bulls, two more than a year ago, and 50 cows, 11 less than a year ago.

Three bulls were sold during the year for a total of £1,000; 27 head of mixed cattle were sold for slaughter and brought £679; and two heifers were sold to Wagga High School for £60 for education uses.

Twenty-two females were transferred to Grafton Experiment Farm, 10 steers were killed for rations, and 16 cull dairy cows were received from the College Jersey Stud.

Heavy culling throughout the year has helped the stud to settle into a more compact high class unit and, with all low producers and non-breeders out, the all-round performance has already improved. The new sire "Prongorong Icicle" has proved a good buy. His stock are of particularly high quality.

Reserve Junior Champion at Sydney Royal Show and Champion Bull and Cow at Wagga Show were among the many prizes won by College beef cattle exhibited at the two Shows this year.

Horse Section.—There were 62 head at 30th June, 1963, two less than at 30th June, 1962. The 62 comprised five entire, 30 mares, 13 geldings, and 12 foals.

Three stallions, 11 females and two foals were sold to private enterprise for a total of £2,352. Demand for sale stock was well maintained and the figures do not include several more that have been sold but not yet delivered. Two geldings and one mare were transferred as hacks to other institutions.

Twelve mares privately owned were serviced by the College stallions and the fees and agistment charges returned £263.

The stud exhibited at Sydney Royal Show with success, the team of four mares and one stallion gaining Champion Mare and Reserve Champion Mare, the Lady Wentworth Trophy and other lesser prizes.

The stallion "Sala" (Imp.) returned to the stud from Hawkesbury Agricultural College and his second cross progeny will be keenly watched by those interested in breeding.

Animal Health (Veterinary Officer Section).—The two herd policy in the Dairy Section continued to operate successfully for control of vibriosis though the disease is still causing trouble in the "dirty" herd and an infertility of unknown cause is present in the "clean" herd.

The mastitis trial commenced last year was abandoned. The herd mastitis problem is not acute. A trial for prevention of traumatic reticulitis was commenced but results will not be known for some years.

Occurrence of a number of lethal and sublethal conditions in calves in this herd has demonstrated the dangers of close inbreeding.

In the Beef Cattle Section, vibriosis was suspected in a transitory infertility problem but not confirmed. Suspected phosphorous deficiency and enterotoxaemia cases occurred.

In the Horse Section a relatively high worm burden has again been found and treated. Ill effects were limited to two suspected verminous aneurism cases. Control is difficult due to lack of rotational grazing and fixed stalls.

In the Piggery Section the rhinitis outbreak has subsided and no evidence has been observed for some months. Fertility and neonatal losses have returned to normal after being low and high respectively during the rhinitis outbreak.

Blood reactors to swine fever led to some research but with no results to date and swine fever has not been confirmed here. The piggery is in quarantine.

Fowl pox vaccination was performed on the fowls but not the turkeys and these later sustained a mild outbreak with no losses. The annual pullorum test is as yet incomplete, with three reactors (0.5 per cent) to date.

Investigations into the Dorset Horn infertility continued but only relating to pasture oestrogens.

An outbreak of ovine brucellosis occurred due to infected stray rams. It has been eradicated by segregation, regular palpation, blood and semen testing and slaughter. False positive tests, doubtful reactions and chessey gland infection in the epididymus caused some difficulties.

Positive reactors to ovine vibriosis have been obtained also but the significance is unknown.

Work on a new electroejaculator shows promise of a machine for collecting semen without muscular contraction.

H. J. HYNES, Acting Director-General.

4th October, 1963.

APPENDICES

I. Accounts of the Department of Agriculture, 1962-63.

II. The Published Matter of officers of the Department of Agriculture, 1962-63.

APPENDIX I

The Accounts of the Department of Agriculture, 1962-63

The cost of maintaining the Department of Agriculture is met from the Consolidated Revenue Fund, whilst capital expenditure on buildings and permanent improvements to departmentally-owned property is financed from the General Loan Account. In addition to these general classifications of expenditure, the Department is assisted in the financing of certain specified lines of research and development and the control of insect pests and animal diseases by direct levies on industry and by grants from the Commonwealth Government and public and private organisations. Operations of this nature are reflected in a large number of separate accounts within the general Treasury classification of "Special Deposits Account", some details of which are given elsewhere in this Appendix.

COMPARATIVE STATEMENT OF EXPENDITURE

Account	1961-62	1962-63	Increase or Decrease
	£ s. d.	£ s. d.	£ s. d.
Consolidated Revenue Fund	4,315,196 17 8	4,757,618 14 0	442,421 16 4 (Increase)
General Loan Account	160,221 17 1	210,831 14 2	50,609 17 1 (Increase)
	£ 4,475,418 14 9	4,968,450 8 2	£493,031 13 5 (Increase)

EXPENDITURE FROM CONSOLIDATED REVENUE FUND

The following tabulation is a comparison of expenditure by the functional Divisions of the Department for the last two financial years :—

Division	1961-62	1962-63	Increase or Decrease
	£ s. d.	£ s. d.	£ s. d.
Central Administration	781,310 5 11	1,071,901 6 10	290,591 0 11 (Inc.)
Science Services	183,290 12 4	213,742 19 6	30,452 7 2 (Inc.)
Plant Industry	258,130 16 6	273,615 10 3	15,484 13 9 (Inc.)
Horticulture	234,198 6 2	243,866 1 11	9,667 15 9 (Inc.)
Dairying	230,910 19 2	237,936 6 3	7,025 7 1 (Inc.)
Hawkesbury Agricultural College	258,335 16 0	268,077 5 2	9,741 9 2 (Inc.)
Wagga Agricultural College	129,714 0 10	131,847 14 11	2,133 14 1 (Inc.)
Experiment Farms and Stations	442,490 0 3	462,889 11 4	20,399 11 1 (Inc.)
Animal Industry—			
Head and District Offices	624,907 13 7	674,476 14 3	49,569 0 8 (Inc.)
Queensland Border	84,919 14 3	94,432 10 6	9,512 16 3 (Inc.)
Tick Quarantine Areas	944,444 8 1	943,888 15 8	555 12 5 (Dec.)
Royal Botanic Gardens	142,544 4 7	140,943 17 5	1,600 7 2 (Dec.)
Totals	£ 4,315,196 17 8	4,757,618 14 0	442,421 16 4 (Inc.)

Of the increase of £442,421 16s. 4d. a recoverable advance to the Grain Elevator Board of New South Wales accounts for £250,000, the remainder being fairly evenly spread over all sections of the Department would represent a normal increase due to growth.

EXPENDITURE FROM GENERAL LOAN ACCOUNT

Expenditure from General Loan Account for the year was £210,831 14s. 2d., of this £72,629 14s. 3d. was spent on the new dormitory block at Wagga Agricultural College, £15,139 4s. 4d. on the new administration and laboratory block at Leeton Agricultural Research Station and £54,024 3s. 5d. on the establishment of a training centre for the new Farm Certificate Course which is being established at Yanco.

The following are details of amounts expended from General Loan Account during the financial year 1962-63 on works at various Institutions of the Department:—

	£	s.	d.
Hawkesbury Agricultural College—			
New General Store	2,792	15	1
Wagga Agricultural College—			
Agronomy Laboratories—Research Institute	166	11	6
Extensions to Graham Block	640	0	0
Honey House	1,099	11	1
Irrigation Works	4,680	0	0
New Dormitory Block	72,629	14	3
Poultry Slaughterhouse	480	0	0
Soil Testing Investigation Shed—Research Institute	2,560	0	0
Experiment Farms and Stations—			
Alstonville Tropical Fruit Research Station—			
New Fruit Packing Shed	223	2	7
Dareton Horticultural Research Station—			
Escape Channel	8,000	0	0
Fruit Packing Shed	151	10	0
Water Supply	1,500	0	0
Leeton Agricultural Research Station—			
New Administration and Laboratory Block	15,139	4	4
Narara Horticultural Research Station—			
New Fruit Packing Shed	5	0	0
Narrabri Experiment Farm—			
Irrigation	1,980	0	0
Trangie Agricultural Research Station—			
Beef Cattle Section	2,953	4	1
Cottage	4,123	0	0
New Administration Building	10,565	4	0
Wollongbar Agricultural Research Station—			
Piggery Research Section	3,026	1	2
Yanco Agricultural Research Station—			
New Farm Certificate Training Centre	54,024	3	5
Remodelling of Kitchen	9,816	9	9
Division of Animal Industry—Head and District Offices—			
Glenfield Veterinary Research Station—			
Extensions to Laboratories	14,276	2	11
	£210,831	14	2

COMMONWEALTH UNEMPLOYMENT RELIEF GRANT

This Department was allotted £30,000 from the special Commonwealth Unemployment Relief Grant made during 1962-63; £26,613 7s. 2d. of this amount was expended on the following works:—

	£	s.	d.
Hawkesbury Agricultural College—			
Agronomy Shed	3,775	8	0
Wagga Agricultural College—			
Additional Water Supply	3,123	1	6
Completion of Stud Horse Section	4,200	4	0
Mechanics Workshop	7,565	13	0
Experiment Farms and Stations—			
Condobolin Experiment Farm—			
Granary	600	0	0
Cowra Experiment Farm—			
Hay Shed	759	10	0
Glen Innes Agricultural Research Station—			
Maize Shed	2,000	0	0
Griffith Horticultural Research Station—			
Amenities Room	659	10	8
Tamworth Agricultural Research Station—			
Agronomy Shed	3,930	0	0
Carried forward to 1963-64 to meet final payments on above Works	3,386	12	10
	£30,000	0	0

OTHER ACCOUNTS

Special Deposits Account

Following is a complete list of accounts and funds within the Special Deposits Account at the Treasury on which this Department operates:—

Name of Account	Balance as at 1st July, 1962	Receipts 1962-63	Payments 1962-63	Balance as at 30th June, 1963
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Advances to Officers for Purchase of Motor Cars	Dr. 110,463 2 3	48,651 5 11	53,068 4 7	Dr. 114,880 0 11
Contribution towards running expenses of Tractor Mower at Centennial Park	39 1 5	.....	39 1 5	.....
Potato Growers' Licensing Act, 1940	1,020 4 3	2,202 7 1	1,946 11 8	1,275 19 8
Commonwealth—State Flood Relief Scheme, 1963 ..	.....	130,000 0 0	80,196 12 3	49,803 7 9
Balance of Salaries Adjustment Suspense Account ..	51,705 17 8	46,861 18 10	51,705 17 8	46,861 18 10
Commonwealth—State Flood Relief Scheme, 1961 ..	18,000 12 8	15,000 0 0	20,512 13 8	12,487 19 0
Government Printing Office—Working Account and Stores Account and Sale of Publications .....	.....	1,230 4 6	95 18 9	1,134 5 9
Noxious Insects Destruction Account	9,941 1 10	15,022 15 1	8,936 1 5	16,027 15 6
Swine Compensation Fund	29,536 7 8	68,274 4 0	52,867 11 2	44,943 0 6
Treasury Fire Risks .....	.....	240 12 10	.....	240 12 10
Hawkesbury Agricultural College Canning Factory Account	1,920 17 0	1,949 18 8	532 6 2	3,338 9 6
Bush Fire and Flood Relief Account (State)	11,888 1 2	.....	3,239 8 1	8,648 13 1
Hawkesbury Agricultural College—Dairying Factory Working Account	48,596 9 10	186,221 8 7	184,043 9 6	50,774 8 11
Tobacco Industry Trust Account	10,787 0 8	4 0 0	8,742 10 2	2,048 10 6
Pasture Control Account	10,041 7 5	.....	.....	10,041 7 5
Potato Marketing Board of New South Wales—Funds upon Dissolution Account .....	.....	11,195 3 10	10,900 0 0	295 3 10
Unclaimed Moneys Account	872 9 0	1,266 3 6	792 0 10	1,346 11 8
Commonwealth Grant towards the Promotion of Improved Practices in the Dairying Industry	7,195 9 0	65,544 15 5	60,392 1 2	12,348 3 3
Commonwealth Grant—Expansion of Agricultural Advisory Services—New South Wales	13,515 17 6	77,907 3 0	81,801 5 0	9,621 15 6
Cattle Compensation Fund	599,767 12 7	379,087 4 9	252,565 7 9	726,289 9 7
V.P. Bragg Scholarship—Wagga Agricultural College ..	149 14 8	307 10 0	430 0 0	27 4 8
Wagga Agricultural College Swimming Pool Account ..	914 14 6	859 18 4	.....	1,774 12 10
Wheat Industry Stabilisation Fund (Disposal) for Research and Extension in the Wheat Industry ..	.....	117,961 0 0	.....	117,961 0 0
V.P. Bragg Scholarship Account (Investment)	6,000 0 0	.....	.....	6,000 0 0
Wagga Agricultural College Swimming Pool Account (Investment Account)	5,500 0 0	.....	.....	5,500 0 0
Potato Marketing Board of New South Wales— Investment upon Dissolution Account .....	.....	10,900 0 0	.....	10,900 0 0
Egg Marketing Board for the State of New South Wales—Triennial Elections, 1961	Dr. 761 19 10	761 19 10	.....	.....
French Bean Seed Marketing Board of New South Wales—Triennial Elections .....	.....	9 12 8	9 12 8	.....
French Bean Seed Marketing Board of New South Wales—Dissolution Poll .....	.....	.....	8 9 4	Dr. 8 9 4
Lemon Marketing Board for the State of New South Wales—Poll on question of Constitution of a .....	.....	.....	149 18 8	Dr. 149 18 8
Rice Marketing Board of New South Wales—By- election for Producers' Representative	Dr. 27 16 8	74 10 8	46 14 0	.....
Wine Grapes Marketing Board Triennial Elections ..	.....	72 17 8	72 4 3	0 13 5
Additional Poultry Housing for Random Sample Tests at Hawkesbury Agricultural College	Dr. 3,811 8 7	635 4 9	.....	Dr. 3,176 3 10
Swine Fever Outbreak—Payment of Compensation ..	Dr. 50,000 0 0	.....	.....	Dr. 50,000 0 0
Hawkesbury Agricultural College Trust Account ..	5,613 6 8	9,374 13 7	6,813 17 7	8,174 2 8
Wagga Agricultural College Trust Account	1,449 4 8	2,660 0 4	2,109 13 1	1,999 11 11
Yanco Agricultural Research Station Trust Account ..	.....	1,140 0 0	444 4 3	695 15 9
Advertising—Department of Agriculture Publications Account	1,238 3 5	9,591 2 10	10,596 1 6	233 4 9
Australian Cattle and Beef Research Committee— Pasture Species Investigations with particular reference to Summer Legumes .....	.....	5,212 10 0	4,498 2 10	714 7 2
Australian Cattle and Beef Research Committee— Major and Minor Element Deficiencies in Soils from Beef Areas .....	.....	725 0 0	.....	725 0 0
Australian Cattle and Beef Research Committee— Phosphate Levels in North Coast Soils with specific relation to Summer Legumes .....	.....	487 10 0	.....	487 10 0
Australian Cattle and Beef Research Committee— Pasture Intake and Digestibility Studies— Production of more Beef per acre on Irrigated Pastures .....	.....	615 0 0	1,058 8 10	Dr. 443 8 10
Australian Cattle and Beef Research Committee— Winter Nutrition on Northern Tablelands .....	.....	6,760 0 0	3,161 14 3	3,598 5 9
Australian Cattle and Beef Research Committee— Nature and Organisation of the Australian Beef Cattle Industry .....	.....	250 0 0	63 12 10	186 7 2
Australian Dairy Produce Board—Grant for Research Projects—Socio-Economic Investigations	1,306 6 11	1,400 0 0	2,724 13 9	Dr. 18 6 10
Australian Dairy Produce Board—Grant for Research Projects Expansion of Pasture Species Research ..	232 1 2	5,644 13 4	5,342 7 4	534 7 2

Special Deposits Account—continued

Name of Account	Balance as at 1st July, 1962	Receipts 1962-63	Payments 1962-63	Balance as at 30th June, 1963
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Australian Dairy Produce Board—Grant for Research Projects—Expansion of Other Pasture and Animal Research	Dr. 240 17 3	9,093 0 0	8,876 15 8	Dr. 24 12 11
Australian Dairy Produce Board—Grant for Research Projects—Dairy Manufacturing Research Problems of Blue Vein Cheese Production	4,337 4 5	3,787 5 0	6,929 17 0	1,194 12 5
Australian Dairy Produce Board—Composition of Milk .....	.....	2,750 0 0	2,159 6 0	590 14 0
Australian Dairy Produce Board—Efficiency of Detergents .....	.....	900 0 0	385 3 1	514 16 11
Australian Turkey Federation—Contributions for extensions of Facilities at Wagga Agricultural College Turkey Demonstration Centre	250 0 0	.....	40 4 1	209 15 11
Banana Research Committee Grant for Research .....	.....	1,050 0 0	2 8 0	1,047 12 0
Board of Tick Control Employees' proportion of Contributions to Local Government Superannuation Scheme	6,442 2 4	20,506 11 9	20,505 11 7	6,443 2 6
Brown Rot Investigations—Trust Fund	224 9 5	827 0 7	330 15 8	720 14 4
Commonwealth Contribution towards cost of Investigation into Excess Spray Residue on Fruit	989 6 0	4,175 0 0	5,451 12 6	Dr. 287 6 6
Commonwealth Grant for Relief of Growers in the Tobacco Industry	25,000 0 0	.....	25,000 0 0	.....
Commonwealth Grant—Milking Machine Components Testing Station .....	.....	1,000 0 0	379 2 11	620 17 1
Contributions by Industry towards research into Meat Meal Quality at Seven Hills Poultry Research Station	1,811 1 5	1,010 10 0	1,821 11 5	1,000 0 0
Contributions by States towards salary and expenses of Patrol Officer, Grasshopper Control	404 13 10	.....	154 8 0	250 5 10
Contributions for Plague Locust Trial Control Campaign	35,615 17 7	.....	35,615 17 7	.....
Contributions to Pasture Research—Mid-Coast and Hunter Region	1,785 2 4	.....	968 15 7	816 6 9
Contributions towards Animal Insect Pest Investigations—Glenfield Veterinary Research Station ..	521 13 11	.....	.....	521 13 11
Contributions towards establishment of Library at Agricultural Research Institute, Wagga	26 11 6	.....	18 5 4	8 6 2
Contributions towards development of Tamworth Experiment Station	1,068 1 4	.....	392 19 0	675 2 4
Department of Agriculture Suspense Account	47,796 0 4	139,591 15 8	177,045 2 7	10,342 13 5
Donation by I.C.I.A.N.Z. towards Pasture Fertilizer Nitrogen Investigations	248 7 4	.....	1 13 10	246 13 6
Exhibit at World Poultry Congress, 1962	3,600 0 0	.....	3,600 0 0	.....
Fire Damage Account	240 12 10	.....	240 12 10	.....
Geigy Agricultural Chemicals contribution towards Weedicide Research Project at Hawkesbury Agricultural College	99 10 2	.....	6 15 7	92 14 7
Hawkesbury Agricultural College Egg Laying Competition Prize Fund	1,070 19 11	1,192 18 1	1,947 7 11	316 10 1
Hawkesbury Agricultural College Swimming Pool ..	1,343 3 6	.....	1,343 3 6	.....
Horse Breeding Fund	142 18 10	.....	.....	142 18 10
Legume Inoculant Association contribution towards Research and Service in the Field of Rhizobiology ..	2 14 6	.....	.....	2 14 6
Manning District Agricultural Research Council Contribution for Pasture Research in the Manning District	281 16 3	1,250 0 0	1,365 3 11	166 12 4
Pender W. S. Memorial Fund—Interest on Bonds	106 1 6	46 8 9	103 2 6	49 7 9
Reserve Bank of Australia Grant from Rural Credits Development Fund towards whole Farm Feed Year Studies .....	.....	1,200 0 0	725 6 1	474 13 11
Rice Research Laboratory, Yanco	286 0 0	.....	.....	286 0 0
Shannon Vale Nutrition Station Working Account ..	4,709 14 6	6,378 0 0	3,136 2 5	7,951 12 1
The Sulphur Institute of U.S.A. Grant for compilation, &c., of results of U.P.S.E.T. Trials .....	.....	2,217 15 9	10 6 5	2,207 9 4
Tobacco Extension Grant to finance additional Extension Work .....	.....	3,270 0 0	0 7 6	3,269 12 6
Tropical Fruit Research Station	3,149 8 5	.....	6 1 1	3,143 7 4
Unclaimed Salaries and Wages	553 14 10	1,825 11 1	1,810 17 8	568 8 3
Wheat Industry Research Committee of New South Wales Grant towards Baking Quality .....	.....	200 0 0	200 0 0	.....
Wheat Industry Research Committee of New South Wales Grant for Investigation of Black Soil Scarab ..	27 14 9	500 0 0	306 14 4	221 0 5
Wheat Industry Research Committee of New South Wales Grant towards Cropping Trial	476 6 1	.....	124 10 0	351 16 1
Wheat Industry Research Committee of New South Wales Grant for Expanded Wheat Research Projects, Wagga Agricultural Research Institute ..	Dr. 1,017 17 1	7,550 0 0	5,846 14 0	685 8 11
Wheat Industry Research Committee of New South Wales Grant for Frost Resistance Investigations, Agricultural Research Station, Tamworth	3,349 1 0	.....	2,000 0 0	1,349 1 0
Wheat Industry Research Committee of New South Wales Grant towards Moisture Utilisation	829 11 11	200 0 0	1,029 11 11	.....

Special Deposits Account—continued

Name of Account	Balance as at 1st July, 1962	Receipts 1962-63	Payments 1962-63	Balance as at 30th June, 1963
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Wheat Industry Research Committee of New South Wales Grant towards Skeleton Weed Research ..	21 3 0	1,000 0 0	264 17 3	756 5 9
Wheat Industry Research Committee of New South Wales Grant towards Soft Wheat Quality Programme—Central West	1,479 10 0	2,800 0 0	1,791 7 8	2,488 2 4
Wheat Industry Research Committee of New South Wales Grant towards Soil Fertility	2,311 3 7	.....	1,736 10 3	574 13 4
Wheat Industry Research Committee of New South Wales Grant for travel and Capital Expenditure— Dr. A. T. Pugsley and G. M. Halloran .....	.....	1,700 0 0	.....	1,700 0 0
Wheat Industry Research Committee of New South Wales Grant towards Wheat Granularity	137 3 7	.....	.....	137 3 7
Wheat Industry Research Committee of New South Wales Grant for Breeding of Improved Wheat Varieties for Irrigation Areas .....	.....	500 0 0	.....	500 0 0
Wheat Industry Research Committee of New South Wales Grant towards Wheat Yield	198 17 4	.....	6 7 6	192 9 10
Wheat Industry Research Council Grant towards Photo-period and Temperature Studies .....	.....	1,100 0 0	635 1 11	464 18 1
Wheat Industry Research Council Grant for Visit to New Zealand of a Soil Chemist .....	.....	300 0 0	292 9 7	7 10 5
Wheat Industry Research Council Grant for Investiga- tion into Possibilities of Segregation of Wheat on the basis of Quality	711 2 8	2,500 0 0	2,304 8 11	906 13 9
Wheat Industry Research Council Grant for appoint- ment of Wheat Geneticist at Wagga Agricultural Research Institute	197 15 4	1,753 17 5	2,152 3 10	Dr. 200 11 1
Wheat Industry Research Council Grant for Wheat Root Rot Publication	51 4 5	.....	51 4 5	.....
Wool Research Committee Grant for Investigation of Black Soil Scarab	435 14 1	753 0 0	687 7 8	501 6 5
Wool Research Committee Grant for Fleece Measure- ment for Selection of Stud Merino Rams .....	.....	3,000 0 0	2,727 19 8	272 0 4
Wool Research Committee Grant for Research in Galvanised Burr Control	676 19 4	300 0 0	514 14 4	462 5 0
Wool Research Committee contribution for research into Control of Itch Mite in Sheep	999 6 4	451 0 0	1,314 4 7	136 1 9
Wool Research Committee Grant for Efficiency of Wool Production and Influence of Season on Ram Fertility	1,131 6 11	1,026 0 0	2,169 13 1	Dr. 12 6 2
Wool Research Committee Grant for Co-operative Research into Treatment of non-arable Areas— Serrated Tussock Control	1,196 7 0	1,000 0 0	1,845 17 11	350 9 1
Wool Research Committee for re-establishment of Shannon Vale Nutrition Station	4,767 18 9	.....	2,145 14 5	2,622 4 4
Wool Research Committee Grant for additional Sheep and Wool Advisory Officers	Dr. 23 9 0	6,855 0 0	6,238 5 4	593 5 8
Wool Research Committee Grant for Research into Control of Insecticidal Resistance in Sheep Blowfly Wool Research Committee Grant towards Sheep Breeding and Pasture Management—Relative Efficiency of Several Stocking Rates and Super- phosphate Levels	2,133 15 9	.....	1,629 8 0	504 7 9
	.....	5,700 0 0	5,594 19 5	105 0 7
£	834,124 19 10	1,467,363 4 1	1,253,891 19 8	1,047,596 4 3

Brief details of the legislation covering some of the more important aspects of these accounts, together with short histories of the operations conducted under each of them, were given in the Annual Report of 1957-58.

The following additional information is now offered in respect of such of the accounts as appear to warrant further amplification:—

Swine Compensation Fund

	£ s. d.
Balance as at 1st July, 1962	20,463 12 4 Dr.
Receipts—	
Stamp Duty	68,274 4 0
	47,810 11 8
Disbursements—	
Swine Compensation	52,867 11 2
Balance as at 30th June, 1963	(a) £5,056 19 6 Dr.

(a) An amount of £50,000 was advanced by the State Treasury to enable payment of compensation to be made in excess of the amount available in the Fund. After deduction of the debit balance of £5,056 19s. 6d. on the Fund at 30th June, 1963, there remained £44,943 0s. 6d. of the special advance to meet further claims. It is to be noted that the full £50,000 advance is repayable to the State Treasury.

Income from Stamp Duty rose by £15,479 17s. 5d. from £52,794 6s. 7d. in 1961-62 to £68,274 4s. 0d. in 1962-63. This is due to the increase in Stamp Duty from 6d. to 2s., which has operated from October, 1961, following the outbreak of Swine Fever.

The increased rate of income from Stamp Duty was not sufficient to maintain the account until disbursements began to fall from January, 1962, since when the Fund has continued to steadily increase.

Cattle Compensation Act, 1951 (as amended)

Disease	Claims			Animals			Payments					
	Reg. 5	Reg. 6	Total	Reg. 5	Reg. 6	Total	Reg. 5		Reg. 6		Total	
							£	s. d.	£	s. d.	£	s. d.
Tuberculosis.....	1,641	769	2,410	4,792	1,531	6,323	85,879	8 1	39,957	12 5	125,837	0 6
Cancer	3,189	311	3,500	4,495	417	4,912	53,814	6 2	7,733	9 4	61,547	15 6
Actinomycosis	2,305	11	2,316	1,832	11	1,843	32,891	4 6	120	6 4	33,011	10 10
Actinobacillosis	826	2	828	1,005	2	1,007	11,060	7 7	45	8 0	11,105	15 7
Pleuro Pneumonia Contagiosa ..	1	..	1	1	..	1	37	0 0	..	..	37	0 0
Trichomoniasis	1	..	1	1	..	1	22	0 0	..	..	22	0 0
Tick Fever	4	..	4	13	..	13	197	19 4	..	..	197	19 4
John's Disease	..	..	..	..	..	..	..	..	..	..	..	..
Vibriosis	..	..	..	..	..	..	..	..	..	..	..	..
Totals	7,967	1,093	9,060	12,139	1,961	14,100	£183,902	5 8	47,856	16 1	£231,759	1 9

SUMMARY OF RECEIPTS AND PAYMENTS

	£	s. d.	£	s. d.	£	s. d.
Balance of Fund as at 1st July, 1962					£599,767	12 7
Add Receipts—						
Levy			£275,456	16 4		
Sale of Stamps			103,630	8 5		
Refund Overpayments			2	15 0		
					379,089	19 9
					£978,857	12 4
Deduct Payments—						
Compensation			£231,759	1 9		
Administration Costs—						
Legal Costs			£27	4 6		
Allowances to Secretaries, Pastures Protection Boards..			2,125	0 0		
Department of Agriculture			18,656	16 6	20,809	1 0
					252,568	2 9
Balance of Fund at 30th June, 1963					£726,289	9 7

Commonwealth Dairy Industry Extension Grant

The continuance of this grant has been approved to 30th June, 1964, under the terms and conditions set out in the Department's report for the year ended 30th June, 1953.

The first grant was received in October, 1948, and expenditure to 30th June, 1963, amounted to £952,269 10s. 8d.

Item	1948-49 to 1961-62	1962-63	Total
	£ s. d.	£ s. d.	£ s. d.
Organising Officers	154,020 11 3	8,737 9 6	162,758 0 9
General Publicity	86,044 19 9	3,546 14 8	89,591 14 5
Demonstrations	169,159 12 0	3,188 6 8	172,347 18 8
Competitions	7,437 7 4	..	7,437 7 4
Field Days.....	88 15 7	..	88 15 7
Herd Recording	268,733 17 10	25,950 0 0	294,683 17 10
Artificial Insemination	60,075 15 3	..	60,075 15 3
Statistical Work	18,034 1 9	..	18,034 1 9
Herd Surveys	26,165 6 8	..	26,165 6 8
Punch Card Equipment	28,861 5 10	1,555 18 0	30,417 3 10
Milking Machine Survey	30,628 8 7	9,641 19 3	40,270 7 10
Contribution towards attendance of representative at International Study Centre	400 0 0	..	400 0 0
Contribution towards attendance of representative at Maryland University	806 16 3	..	806 16 3
Milking Machine Testing Station	4,882 14 5	..	4,882 14 5
Survey—Infertility in Dairy Herds	9,827 8 2	1,294 7 11	11,121 16 1
Agricultural Trainees	20,000 0 0	4,000 0 0	24,000 0 0
Sire Survey	2,469 9 11	782 1 11	3,251 11 10
Overseas Visit of Senior Women's Extension Service Officer	1,127 13 11	..	1,127 13 11
Testing Stations—Air-flow Meters	113 5 0	2 9 3	115 14 3
Publication of Book "Weeds"	3,000 0 0	..	3,000 0 0
Overseas Visit—A. C. Small	..	1,692 14 0	1,692 14 0
	£ 891,877 9 6	60,392 1 2	952,269 10 8

Commonwealth Grant—Expansion of Agricultural Advisory Services—N.S.W.

The Commonwealth agreed to make grants to the States to permit of the expansion of the Agricultural Advisory Services. Initially the grants were for a five year period ended 30th June, 1957. They have been continued and the current agreement will terminate on 30th June, 1965.

Expenditure to 30th June, 1963, is shown below:—

Item	1952-53 to 1961-62	1962-63	Total
	£ s. d.	£ s. d.	£ s. d.
Crop and Pasture Demonstrations	90,776 5 5	615 14 11	91,392 0 4
Livestock Demonstrations	27,575 5 9	2,791 18 10	30,367 4 7
Horticultural Demonstrations	14,989 19 3	1,706 9 3	16,696 8 6
Agricultural Machinery Demonstrations	23,540 6 10	4,835 7 1	28,375 13 11
Irrigation Equipment and Demonstrations	1,100 16 5	.....	1,100 16 5
Field Assistants and Motor Vehicles	196,528 16 7	31,694 2 0	228,222 18 7
Extension Aid Equipment	45,719 10 3	2,543 7 8	48,262 17 11
Publicity Officers	84,093 19 0	21,564 17 5	105,658 16 5
Production of Agricultural Publications	32,407 3 3	3,097 13 10	35,504 17 1
Production of Agricultural Films	2,870 17 1	.....	2,870 17 1
Purchase of Books	8,911 8 7	1,265 18 11	10,177 7 6
Overseas Visits of Agricultural Officers	8,891 16 5	.....	8,891 16 5
Agricultural Trainees and Cadets	61,548 19 2	8,118 7 5	69,667 6 7
Administration	8,037 2 6	1,532 14 1	9,569 16 7
Water and Soil Testing	1,482 16 9	2,034 13 7	3,517 10 4
Totals	£ 608,475 3 3	81,801 5 0	690,276 8 3

Noxious Insects Destruction Account

The Noxious Insects Act of 1934 provides for the striking of a levy under specified conditions, as a contribution towards the cost of suppression and destruction of noxious insects. Receipts are paid into Special Deposits Account and moneys at the credit of this account are applied by the Minister for the purposes prescribed in the Act.

No levies were struck during the 1962 calendar year, nor has any levy been struck to 30th June, 1963. Levies received during the financial year ended 30th June, 1963, were arrears for the 1961 calendar year.

Following is a statement of receipts and payments for the year 1962-63:—

RECEIPTS			PAYMENTS		
	£	s. d.		£	s. d.
Sale of Materials	266	0 0	Poison and Materials and Sundry Purchases..	6,615	8 3
Levies	220	5 10	Maintenance of Plant	203	11 2
Refund from Plague Locust Trial Control			Cartage	147	2 0
Campaign Fund.....	14,508	6 9	Purchase of Steel Storage Shed	1,492	0 0
Sundries	28	2 6	Contribution towards cost of Survey by visiting		
			Entomologist	478	0 0
	15,022	15 1		8,936	1 5
Balance as at 1st July, 1962	9,941	1 10	Balance as at 30th June, 1963	16,027	15 6
	£24,963	16 11		£24,963	16 11

Potato Growers' Licensing Act, 1940 (as amended)

Transactions on this account for the year 1962-63 were:—

RECEIPTS			PAYMENTS		
	£	s. d.		£	s. d.
Balance as at 1st July, 1962	1,020	4 3	Grants to Potato Growers' Association	1,800	0 0
Licence Fees	2,202	7 1	Postage	47	16 8
			Issue of Licences	98	15 0
			Balance as at 30th June, 1963	1,275	19 8
	£3,222	11 4		£3,222	11 4

RECEIPTS						PAYMENTS					
	£	s.	d.	£	s.	d.		£	s.	d.	
Balance at 1st July, 1962				4,709	14	6	Wages	1,615	14	0	
Sale of Wool	5,323	10	2				Workers' Compensation Insurance	27	16	11	
Sale of Livestock	1,016	5	3				Payroll Tax, 1961-62	33	8	3	
Sale of Skins	7	1	4				Freight and Cartage	231	10	10	
				6,346	16	9	Motor Fuel	48	14	9	
Agistment				3	15	0	Vaccine and Drenches	408	11	0	
Rent of Cottage				27	8	3	Fertilizers	534	7	6	
							General Supplies	194	1	3	
							Tractor Insurance	8	4	7	
							Plant Maintenance and Repairs	33	13	4	
							Balance as at 30th June, 1963	7,951	12	1	
				£11,087	14	6					

Contribution by Milk Board to meet cost of Herd Testing for Tuberculosis

RECEIPTS				PAYMENTS			
	£	s.	d.		£	s.	d.
Balance at 1st July, 1962.....	231	12	1	Salaries	4,145	0	8
Contributions by Milk Board	4,768	7	11	Employer's Proportion of Superannuation			
				Contributions	307	19	3
				Workers' Compensation Insurance Premium ..	86	5	5
				Payroll Tax	111	0	10
				Travelling Expenses	296	14	7
				Postage	11	13	4
				Ear Tags	39	1	3
				Balance at 30th June, 1963 (Representing Amount over-contributed by Milk Board)	2	4	8
	£5,000	0	0		£5,000	0	0

The Act provides for the establishment of a Board to be called "Board of Veterinary Surgeons of New South Wales". Fees and penalties collected under the Act are paid to the credit of Consolidated Revenue Fund, from which administrative expenses are met. There were 470 registered Veterinary Surgeons at 30th June, 1963.

RECEIPTS			PAYMENTS		
	£	s. d.		£	s. d.
Registration Fees	35	14 0	Salaries	651	18 1
Restoration Fees	7	7 0	Members' Fees	100	16 0
Roll Fees	1,013	0 4	Travelling Expenses	10	8 4
Examination Fees	31	10 0	Postal Expenses	39	2 6
			Printing	78	2 8
			Fees for examination of Foreign Graduates ..	63	0 0
			Excess of Receipts over Payments	144	3 9
	<u>£1,087</u>	<u>11 4</u>		<u>£1,087</u>	<u>11 4</u>

Meat Inspection Service

This service is administered under the Meat Industry Act, 1915, as amended, which makes provision for inspection fees.

Following is a statement of receipts and payments of the Meat Inspection Service for the year ended 30th June, 1963:—

RECEIPTS			PAYMENTS		
	£	s. d.		£	s. d.
Inspection Fees—			Salaries and Wages	270,010	15 0
Regulation No. 7	177,901	3 1	Casual Labour	4,944	19 5
Regulation No. 8	39,452	10 6	Retirement Leave Payments	1,842	6 1
Regulation No. 9	130,583	6 0	Metropolitan Meat Industry Board Officers' Endowment Fund Contribution	3,082	4 8
Regulation No. 10	646	2 8	Travelling Expenses	14,063	17 7
Contributions	100	0 0	Freight and Cartage	136	8 11
			Postal and Telephone	445	11 0
			General Stores	2,161	17 0
			Gas and Electricity	6	7 8
			Rent	562	8 7
			Advertising	0	8 0
			Printing	23	13 3
			Contribution to cost of Accommodation—		
			Homebush Abattoir	1,950	0 0
			Surplus of Receipts over Payments	49 452	5 1
	£348,683	2 3		£348,683	2 3

Whilst there was a surplus of £49,452 5s. 1d. of receipts over payments overhead expenses amounting to £54,991 2s. 11d. have not been taken into account. These include employer's superannuation contribution, workers' compensation insurance and payroll tax, calculated at 20 per cent of cost of salaries and wages (£274,955 14s. 5d.). Applying this figure results in a deficiency of £5,538 17s. 10d. for the year.

Fund Created by the Wheat Marketing (Barring of Claims) Act of 1929 (as amended)

REVENUE ACCOUNT FOR THE YEAR ENDED 30TH JUNE, 1963

	£	s. d.		£	s. d.
To Miscellaneous Disbursements	269	1 9	By Interest on Investments (including Savings Bank Interest)	2,020	13 4
Commitments	1,691	0 0			
Balance—Net Surplus transferred to Accumulated Funds Account	60	11 7			
	£2,020	13 4		£2,020	13 4

BALANCE SHEET AS AT 30TH JUNE, 1963

LIABILITIES				ASSETS			
	£	s. d.	£	s. d.		£	s. d.
Accumulated Funds—					Investments in Government Securities (face value)	45,070	0 0
Balance as at 1st July, 1962	46,178	1 4			Balance in Savings Bank	2,716	6 0
Part Commitments as at 30th June, 1962, not required	244	0 0			Interest accrued at 30th June, 1963	516	18 3
Net surplus for year ended 30th June, 1963	60	11 7					
			46,482	12 11			
Commitments as at 30th June, 1963			1,820	11 4			
			£48,303	4 3		£48,303	4 3

STATEMENT OF RECEIPTS—CONSOLIDATED REVENUE FUND—FINANCIAL YEAR 1962-63

Head of Receipt	Net Receipts					
	£	s.	d.	£	s.	d.
Receipts for Services Rendered—						
Agricultural Colleges and Farms—						
Rents	26,950	0	4			
Students' Fees	65,003	7	5			
				91,953	7	9
Fees—						
Public Officers		4	12			
Apiary Registrations	2,605	6	8			
Cattle Export	20	10	0			
Grading—Dairy Industry Act	1	19	5			
Licence—Dairy Industry Act	7	0	0			
Registration—Dairy Industry Act	7	5	0			
Dairy Science Schools	484	2	6			
Farm Produce Agents' Act, 1926-1932	297	2	0			
Fertilizer Act, 1934	651	0	3			
Pest Destroyers Act, 1945	902	15	0			
Registration of Stock Brands	1,888	15	0			
Registration of Swine Brands	144	6	5			
Stock Foods and Medicines Act, 1940	2,215	12	0			
Veterinary Surgeons' Act, 1923	1,087	11	4			
				10,317	17	7
Contributions—						
Milk Board—T.B. Testing of Herds	4,768	7	11			
Commonwealth Government—Administration of Plant Quarantine	53,167	4	0			
Commonwealth Government—Administration of Animal Quarantine	22,458	0	9			
Commonwealth Government—Administration of Commerce Act	21,391	6	5			
Commonwealth Government—Maintenance of Gardens at Admiralty House	6,828	17	6			
				108,613	16	7
Miscellaneous Services Rendered—						
Plant Diseases Act—Inspection Fees and Fumigation Fees	747	15	2			
Meat Industry Act—Inspection Fees	348,683	2	3			
Commonwealth Scientific and Industrial Research Organisation—Subsidy—Vegetable growing at Hawkesbury Agricultural College		500	0			
Laundry Fees—Hawkesbury Agricultural College	3,892	2	10			
Analyses	58	19	0			
Certification of Seed	9,893	14	8			
Certification of Export Wheat	819	0	0			
Dipping Stock	4,914	5	5			
Flour Certificates	140	8	0			
Herd Recording	45,048	14	11			
Honey Certificates	61	11	4			
Registration of Hybrid Seed Maize	1,841	14	7			
Seed Testing	305	11	3			
T.B. Testing of Cattle	42	16	0			
Administration of Cattle Compensation Fund	18,656	16	6			
Commission for Collection of Premiums—Group Assurance Hospitals and Medical Funds	1,424	13	0			
Other Miscellaneous Receipts	26	19	8			
				437,058	4	7
						647,943 6 6
General Miscellaneous Receipts—						
Rents exclusive of Land	2,194	10	0			
Fines and Forfeitures—Forfeiture of Bonds, &c.	4,262	14	6			
Sales of Farm Produce—Farms and Institutions	166,461	1	2			
Sale of Government Property	2,073	16	0			
Commonwealth Government—Contribution for Cattle Tick Eradication	354,150	11	10			
Repayments to credit of Consolidated Revenue Votes—Previous	16,694	18	5			
Miscellaneous Receipts on Account of Interest	174	1	10			
Transfer of Part Balances not required	326	8	11			
Licence Fees—Pastures Protection Act	616	0	4			
Broadcasting Fees	17	11	0			
Gas and Electricity	3,211	1	10			
Lavatory Takings	94	10	3			
Postages	91	14	9			
Telephone Calls (private)	808	16	4			
Exchange on Remittances	76	6	7			
3% Contribution—Pastures Protection Boards	25,826	3	7			
Employer's Liability to State Superannuation Fund	2,310	3	11			
Commonwealth Grant towards Cost of Herd Recording	25,950	0	0			
				605,340	11	3
						605,340 11 3
Total Net Receipts	£					1,253,283 17 9

DAIRY PRODUCTS FACTORY—HAWKESBURY AGRICULTURAL COLLEGE

The operations of the Dairy Products Factory during the financial year 1962-63 resulted in a loss of £410 10s. 5d. Abridged final accounts are set out hereunder:—

Manufacturing and Trading Account

	£	s.	d.		£	s.	d.
Stock on hand at 1st July, 1962	3,038	17	2	Sales	160,501	4	4
Purchases	129,952	0	4	Sundry Other Income	175	15	0
Repairs and Maintenance	2,833	14	2	Stock on hand at 30th June, 1963	5,522	15	3
Fuel, Light and Power	4,216	2	1				
Water	1,206	13	6				
Salaries and Wages	7,635	17	0				
Workers' Compensation Insurance	132	11	1				
Payroll Tax	190	18	0				
Superannuation—Employer's Liability	582	11	6				
Depreciation	10,858	14	7				
Sundry Expenditure	222	13	4				
Gross Profit	5,329	1	10				
	£166,199	14	7		£166,199	14	7

Profit and Loss Account

	£	s.	d.		£	s.	d.
Salaries and Wages	3,492	2	0	Gross Profit from Manufacturing and Trading			
Payroll Tax	87	6	0	Accounts	5,329	1	10
Workers' Compensation Insurance	60	12	5	Sundry Income	52	5	3
Superannuation—Employer's Liability	194	14	6	Net Loss	410	10	5
Levies—Butter and Cheese	306	14	9				
Printing and Stationery	88	4	11				
Freight and Cartage	466	15	0				
Laboratory Expenses	88	2	10				
Repairs and Maintenance	290	3	4				
Telephone	93	10	2				
General Expenses	47	5	6				
Depreciation	576	6	1				
	£5,791	17	6		£5,791	17	6

Appropriation Account

	£	s.	d.		£	s.	d.
Superannuation 1961-62—				Balance at 1st July, 1962	10,213	5	3
Employer's Liability	1,016	16	0	Equalisation step up	2,376	9	10
Loss on sale of Assets	1,603	10	9	Expenditure not met from Working Account			
Loss for year 1962-63	410	10	5	(power, water, detergents, &c.)	4,008	2	2
Balance at 30th June, 1963	13,567	0	1				
	£16,597	17	3		£16,597	17	3

APPENDIX II

Published Matter*, 1962-63

*Viz.:—Matter printed as Department of Agriculture (D. of A.) booklets, or contributed to and printed as articles either in Department of Agriculture journals (the monthly *Agricultural Gazette of N.S.W.*, quarterly *Review of Marketing and Agricultural Economics*, bi-monthly *Dairy Topics*, monthly *Poultry Notes*, the periodical *Research and the Farmer*) or the journals of other institutions/organisations; and papers published in the proceedings of technical conferences.

The Appendix does not list the many times greater volume of items contributed in the course of extension work through such channels as the Department's weekly printed *Press Copy*, and the regional/district publicity releases for newspapers and radio stations. Indications of the volume of this published matter are included in this report under "Division of Information Services" and "Regional Extension Services".

A. EXPERIMENT FARMS AND STATIONS BRANCH— FARM MECHANISATION ADVISORY SERVICE

D. of A. Booklets

- Drever, J. G. J.—The hydraulic ram. 4 pp.
Drever, J. G. J.—Tools and equipment for farm workshop. 1st ed. 6 pp.
Drever, J. G. J.—Will you be one of the 50 killed? Tractor Safety Pamphlet. 2 pp.

B. DIVISION OF PLANT INDUSTRY

D. of A. Booklets

- Anon.—Growing swedes and turnips for market. 4th ed. 2 pp.
Anon.—Home production of vegetables. 4th ed. 11 pp.
Anon.—Peanut growing. 2nd ed. 12 pp.
Anon.—Production of linseed in New South Wales. 2nd ed. 7 pp.
Anon.—Tobacco growing. 2nd ed. 30 pp.
Anon.—Tomato culture. 7th ed. 24 pp.
Filan, F.—Lucerne—king of fodders. New short edition.
Filan, F.—Management of pastures for seed production. 1st ed. 10 pp.
Kavanagh, L. R.—Story of hybrid maize. 5th ed. 31 pp.
Spencer, R. T.—Cauliflower growing. 5th ed. 16 pp.
Spencer, R. T.—Silver beet. 1st ed. 4 pp.
Squire, M. J. E.—Making good hay. 1st ed. 97 pp.
Walkden Brown, C.—Cereal growing in the new farm programme. 2nd ed. 11 pp.
Walkden Brown, C.—The Kurrajong—a valuable fodder and shade tree. 2nd ed. 19 pp.
York, F. A.—Pastures for the Glen Innes district. 2nd ed. 42 pp.

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